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No. 11

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UDC 632.4:633.1

WHY THE HARVEST YIELD HAS DECLINED

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 p 25

[Article by Z. P. Karamshchuk, docent, Tselinograd Agricultural Institute]

[Text] With repeated plantings of grain crops in rotation in the dark chestnut soils of Northern Kazakhstan, there has been a decline in the harvest yield. In order to determine the reason for this phenomenon, studies have been run (1967 - 1975) on a long-tilled permanent sector of the department of agriculture of the Tselinograd Agricultural Institute (the soil is a dark chestnut loam and the thickness of the humus layer is up to 33 cm). In 1967, a grain-fallow rotation was established: the first year was fallow; the second and third years used winter wheat; the fourth year was wheat and barley. There were different variations on the basic soil treatment process. Core samples of 0.625 cm^2 each were taken in each field of rotation (0.4 hectares) at three fixed sites at levels of 0 - 10, 10 - 20 and 20 - 40 cm. Plant residues which were placed in a Hutchinson medium and potato agar were extracted from them for the purpose of isolating microscopic fungi. The species breakdown of fungi was then determined and they were cultured in a liquid Chapek medium. The toxicity of the culture fluid was tested on wheat shoots (N. A. Krasil'nikova, 1966). Any that reduced seed germination or suppressed the growth and development of the wheat shoots by more than 20% was considered toxic. More than 100 different types of microscopic fungi were analyzed. As a result, it was found that high temperatures and a shortage of moisture in the soil, repeated sowings of wheat in rotation cause a suppression of the soil's biological activity, a reduction in the numbers of bacteria and actinomycetes, disruption in the balance between bacterial and fungal flora, a slowdown in the decomposition of cellulose as well as toxicosis and a drop in the wheat yield. According to the findings of Yu. A. Laznik (1970-1975), during the first year after fallowing, with variable-depth sweep treatment, the wheat yield was 13.3 centners/hectares, 9.9 during the second and 5.3 during the third.

Suppressing the soil's biological activity results in the predominance of the process of vegetable residue accumulation over its decomposition. With sweep treatment, the residues are concentrated basically in the 0 - 10 cm layer of soil (which aids in protection against wind erosion). Their vigorous breakdown occurs here. With plow dressing, plant residues are largely concentrated at a depth of 10 - 20 cm where the processes of decomposition are inhibited.

For this reason, variable depth sweeping is a more suitable soil treatment in four-field grain-fallow rotations. In this rotation, the processes of vegetable residue decomposition take place most intensively during the fallow period.

The build-up of plant residues in the soil with repeated plantings of wheat in a rotation contribute to the active decomposition and diversity in the species composition of microscopic fungi and most of those that reduce or suppress the growth and development of wheat shoots. We have isolated fungi of the genera Stachybotrys, Fusarium, Chaetomium, Penicillium, Alternaria, Murothecium, Helminthosporium and others.

An increase in the numbers of saprophytic fungi in proportion to the build-up of plant residues towards the end of the first phase of rotation is one of the reasons for the appearance of soil toxicity: germination of wheat seeds is suppressed up to 46% and that of barley up to 26%. Suppression in the development of wheat sprouts amounts to 27 - 77% while that for barley is half as much. Harvest yield declines here. Fungal toxins have significantly less effect on barley sprouts than wheat. For this reason, this crop can be planted without risk in a rotation following wheat.

When variable-depth sweeping is used, specimens of the soil microflora reproduce actively in the upper layer of soil while fungal toxins do not build up as a result of the aerobic conditions. Blade dressing contributes to the concentration of toxins primarily in the soil layer with anerobic conditions--10 - 20 cm.

Fungal toxins break down most actively in fallow soil in addition to which, replication of bacterial flora is activated here while plant residues decompose intensively and the number of microscopic fungi is strikingly diminished. This confirms the need for clean fallow in rotations with short stages in the dry steppe region of Northern Kazakhstan.

[502-9003]

9003
CSO: 1840

UDC 632.931/.954:633.15

IN CONDITIONS OF INDUSTRIAL TECHNOLOGY

Moscow ZASHCHITA RASTENIY No 9, Sep 80 pp 20-21

[Article by V. S. Tsikov, director, All-Union Scientific Research Institute for Corn, and L. A. Matyukha, senior scientific associate]

[Text] Intensive use of herbicides has, in many cases, undeservedly pushed agrotechnical methods back into second place and reduced the attention focused on high-quality soil dressing. As a result, for example, in England after 25 - 30 years of using preparations from the 2,4-D group, instances have been noted of an increase in the resistance of the field thistle to its salts and esters while, in the United States, the amaranths are resisting atrazine. There is a real threat of creating resistant biotypes of weed plants.

In our country in the steppe regions of corn cultivation, copious post-harvest grasses such as the blue and green millet and barn grass have increased significantly after many years of chemically treating plantings with derivatives of 2,4-D. The need to introduce grass-controlling herbicides into the crop cultivation process has become apparent which, in turn, will require solutions to a number of complex problems associated with protecting the environment against pollution, preventing a build-up of chemical residues in produce and the like.

The most logical solution to this problem is strict adherence to all elements of agrotechnology that have been developed for each soil-climate zone in consideration of the nature of moisture in the areas, preceding crops, the type of weed problem in fields and controlled use of chemical means to protect the harvest.

Within the system of agrotechnical techniques for eradicating weeds, well-founded placement of field crops in a rotation occupies an important position. For example, in well developed plantings of cereal grains (winter wheat, barley), late spring annuals (millet, common barn grass, the amaranths) which germinate in the spring do not form seed. In sections of intertilled crops planted after winter wheat or rye, conditions are made unfavorable for the growth and development of over-wintering weeds. Because of proper rotation, unfavorable conditions are created for the weed plants and they are more strongly suppressed and more rapidly eradicated from the field than with monocrop cultivation.

The basic soil treatment implemented in relation to the types of weediness present in fields plays an exceptionally important role. With the annual (seed) type where blue and green millet, common barn grass, lambs quarters and amaranths are prevalent in a field, it is necessary to perform variable-depth (6 - 8 and 8 - 10 cm) plowing of the stubble with disc plows with subsequent blade tillage of the fall-plowed field (27 - 30 cm).

In the All-Union Scientific Research Institute for Corn's experiments, 2 - 3 part plowing of stubble has made it possible to reduce weediness in the upper (up to 10 cm) layer of soil from seeds of post-harvest weeds by 25 - 40% and increase the grain yield by 2.5 - 3 centners per hectare in comparison to no-till plots. In addition, this agrotechnique reduces the reproductive capacity of the Swedish fly and winter cutworm while subsequent careful removal of plant residue and deep plowing of the corn stalks into the soil reduces the risk of developing blister smut, stalk and root rot. Unfortunately, there are already frequent instances of poor quality stubble plowing, plowing shortly before corn after early predecessors without tilling first and using plows without skim cotters.

In some corn-growing regions, there has been an increase in the weediness of plantings from perennial rhizomatous-stolonaceous weeds and especially by thistle (field). Since the primary root mass (85 - 90%) of this weed is concentrated in the tilled layer of soil, it is necessary to consider variable depth (8 - 10, 10 - 12 and even 14 - 16 cm) plowing of the stubble with share plows (PPL-10-25) or sweeps (KPU-400) with deep (at least 30 cm) blade plowing in the fall. This type of treatment reduces thistle weediness in corn plantings 3 - 5 times better than plowing of the harvested field with disc tillers.

Double undercutting of thistle roots in the fall to depths of 10 - 12 and 14 - 16 centimeters brings about a significant depletion or recurrent aftergrowth. As a result, after deep fall plowing, weed shoots appear in the spring 12 - 15 days later. With shallow (6 - 8 cm) plowing of the stubble with disc equipment and subsequent tillage, thistle shoots appear much earlier in the spring as soon as the soil temperature is plus 8 - 10°. In conjunction with this, it is necessary to insure that all fields infested with thistle and other perennial rhizomatous-stolonaceous weeds are treated in the fall (before starting tillage with share plows or sweepers).

Spring leveling of the soil with a buck rake at a 45° angle to the direction of the fall plowing provides a large reserve for increasing the corn harvest. Trimming fields and the high-quality dressing of the layer of soil to be seeded makes it possible to obtain a more uniform depth of seed deposition and consequently, shoots that are more nearly alike in size. Plants reach the primary stages of development and maturity simultaneously. As a result, it is possible to carry out all subsequent technological operations at accelerated rates and thereby to utilize the resources of the tractor-machinery fleet and fuel-lubrication materials efficiently and increase labor productivity at harvest.

When corn is planted after corn, a great deal of post-harvest residue which reduces the quality of the pre-seeding treatment of the soil, seeding and maintenance of the plantings remains in the fields. To grind them up, rotary cutters and heavy disc harrows which are currently unavailble to corn producers are needed.

For the sake of high-quality dressing of the upper layer of soil for corn as well as to clear it of any weed plant and seed remnants, with standard mechanized corn-growing technology it is necessary to make two variable-depth cultivations: the first at 10 - 12 cm and a second (pre-seeding) at the seed deposition depth. It is possible to stop with a single pre-seeding cultivation only in carefully tended fields that are well cleared of weeds.

Harrowing is the basic technique for eradicating herbaceous weeds (blue and green millet, common barn grass). Depending on the density and moisture content of the soil, light (ZBP-0.6) or medium (BZSS-1.0) toothed harrows are used for this. The maximum effect is achieved when the harrowing is done 6 - 8 days after the completion of seeding and then repeated at this same interval 3 - 4 times. With proper selection of the type of harrow and speed for moving the aggregate across the field, it is possible to eradicate 75 - 90% of the weed sprouts and shoots with these techniques.

With the shift to the punch technique of planting corn, controlling weeds in protected zones takes on an especially important significance. It is necessary to insure that at the time of the first inter-row tilling operation all the cultivators are equipped with row-type weeding harrows (KRN-38) and that during subsequent operations, they have covering devices (KRN-52-53). In three years of experiments by the Erastovskaya experimental station using row-type weeding harrows in a protected zone, an average of 87% of the weeds were eliminated during the first intertill treatment (N. P. Markov, 1977).

Industrial technology in corn cultivation is based on an abbreviated number of mechanical soil treatments, particularly within the system of caring for the plantings. Combine equipment and highly effective herbicides are used here. It includes plowing of the stubble, applications of mineral fertilizers for the expected yield, deep (27 - 30 cm) blade plowing in the fall, spring dressing of the field with heavy harrows, an application of eradicane (7 liters per hectare with its immediate digging in with a heavy BDT-7 disc harrow in combination with toothed harrows), a pre-seeding soil treatment with an RBK-3 combine or USMK-5.4 cultivator, seeding with SPCh-6 or SUPN-8 punch seeders, post-seeding harrowing and rolling of the soil with ring-spur rollers.

This type of technology has enabled the corn growers of the Chadyr-Lungskiy in 1978 rayon of Moldavia to produce 60 centners/hectares of grain on 18,000 hectares of unirrigated land. In 1979, industrial technology was introduced in the country on 160,000 hectares. A harvest yield of 51.5 centners/hectare was produced over this entire area.

Nevertheless, the individual elements of industrial technology (spring dressing of the field with harrows, the use of heavy disc harrows to dig in herbicides and others) require further and more intensive zonal verification for the purpose of clarifying their effect on the water and air patterns of the tilled layer of soil as well as the process of weed seed germination. An analysis of the phytosanitary conditions (the build up of pests and agents of disease) occuring in plantings of corn while eliminating mechanical techniques of maintenance is also necessary. Wide-scale production testing of the effectiveness of the technology in the primary corn growing zones of the country is needed to solve the problem completely.

Eliminating the weeds in corn fields is possible only with strict adherence to all the elements of agrotechnology and the rational use of herbicides. However, chemical resources of protection must not be substituted for the basic agrotechnical methods of corn cultivation here but rather should only supplement the latter in those cases where it is not possible to suppress weeds without pesticides.

[502-9003]

9003
CSO: 1840

THE FALL CHEMICAL WEEDING

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 pp 53-54

[Article by V. S. Udalov, chief, Moscow Plant Protection Station, vice chairman, "Sel'khozkhimiya" Oblast Association]

[Text] In the Moscow oblast, winter wheat is the primary grain crop and significantly exceeds spring crops in harvest yield. Over the four years of the current five-year plan, 27.2 centners/hectare of winter wheat have been harvested annually while spring crops have yielded 21.7 centners/hectare of oats and 24.1 centners/hectare of barley.

In our conditions, given adequate moisture (or excessive moisture in some years), the application of large amounts of organic (12 tons/hectare) and mineral fertilizers (12 centners/hectare) to fields, especially those set aside for grain crops, optimum circumstances are created for the development of weeds.

Certain failings in agricultural practices and the technology of accumulating, storing and applying organic fertilizers also contribute to the spread of weed plants. Because of the extremely limited period for fall plowing, tillage of the stubble is done on an inadequate scale and it is not always possible to get in a chemical treatment to control rhizomatous-stolonaceous weeds after harvest of the forerunners to winter crops. Application of organic fertilizers in a fresh, unrotted form is tolerated at times.

Herbicides are widely used to control weeds in the oblast. During this five-year plan, chemical weeding is done on 70% of the grain plantings each year. Preparations from the 2,4-D group, and there are enough of them on the market, are used for winter and spring grain crops. However, it is known that a rather large group of herbaceous weeds such as the unscented chamomile, blue cornflower, field bindweed and others are resistant to it. The herbicide 2M-4CP (mecoprop) does a good job of eradicating them but is not adequately available. Therefore, simazin is widely used to control weeds in plantings of winter grain crops on the sovkhozes and kolkhozes of Podmoskov'ye. Technology for chemical weeding of winter crops was developed at the Scientific Research Institute of Agriculture for the central regions of the non-chernozem zone. Many years of practice in using the herbicide in agriculture have made it possible to improve

upon andexpand the techniques for its application. Initially, for example, simazin was applied only with ground equipment although later there was success in using planes and helicopters for this. This makes it possible to conduct fall dressings of winter crops over large areas in a brief optimum period of time (120,000 - 140,000 hectares each year within the oblast).

Agriculture's interest in fall chemical weeding is obvious since it is possible to suppress weeds for which there is no practical means of spring control by using simazin in the fall. In addition, the stress period of spring field operations is relieved and planes and helicopters can be shifted to spreading mineral fertilizers in the spring.

The fall application of simazin is a complex and responsible job requiring strict adherence to established technology. Amounts of 0.5 kg of 50% or 0.3 kg of 80% preparation are applied per hectare. The expenditure of active liquid with ground application is 200 - 300 liters/hectare while that with aerial application is 50 liters/hectare. When the standard for simazin is exceeded, the shoots of winter crops are suppressed or even killed while with underestimation, the effect of chemical weeding becomes inadequate.

Bar sprayers alone are used in ground application. In this process, continuous operational agitation must be maintained or else the preparation precipitates and this disrupts the uniformity of the herbicide's distribution over the field. For the same reasons, overlaps in the sprayer's passes must not be permitted. Aerial treatment is done exclusively with signalmen.

The effectiveness of simazin is also dependent on the pre-seeding preparation of the soil: it must be well worked, leveled and free of any large clods. Herbicide applied to the surface of the soil remains on it in a thin layer (it is not soluble in water and migrates only slightly into the soil), creates a film, as it were, in which the weed shoots die.

Winter wheat and rye, especially during the sprouting stage, do not have sufficient resistance to simazin. For this reason, uniform deposition of seeds at 4 - 5 cm is extremely important. Seed deposited above this level is suppressed by the preparation (particularly during germination). The herbicide is more effective with optimum soil moisture -- 18 - 20% of total field saturation.

Winter fields are sprayed after seeding but before sprouting. This time frame is the optimum. It is also possible to treat at the sprouting stage although by this time, weed shoots have managed to root and have become more resistant to simazin.

As we can see, the difficulties associated with the use of the herbicide on winter crops are not minor ones. It is precisely this that has inhibited the widespread introduction of the method into the practice of sovkhozes and kolkhozes. However, all farms are familiar with it and convinced of its effectiveness and profitability. The increase in the scale of the fall use of simazin within the oblast attests to this: 50 - 70% of the winter crops are being treated with it each year.

According to data from rayon stations for plant protection, the technical effectiveness of chemical weeding in 1979 was 80% in the Klinskiy and Chekhovskiy rayons with aerial spraying (by helicopter), 70% with treatment using tractor-drawn equipment in the Orekhovo-Zuevskiy rayon and 73% in the Lotoshinskiy rayon. The technical effectiveness of the preparation against unscented chamomile with ground spraying on the "Novyy put'" kolkhoz of the Solnechnogorskiy rayon has reached 83%, 88% on the "Veselovskiy" sovkhoz in the Naro-Fominskiy rayon and 81% on the farms of the Orekhova-Zuevskiy rayon. The increase in harvest yield after chemically weeding winter wheat with simazin on the "Kholmogorka" sovkhoz-technical high school in the Volokolamskiy rayon was 5 centners per hectare on 450 hectares (with a yield of 35 centners/hectare) and 6 centners per hectare on 100 hectares on the "Rogachevskiy" sovkhoz in the Dmitrovskiy rayon (with a yield of 35.8 centners/hectares).

Instances of damage to the plantings by the herbicide have also been noted. However, most of the time, these have been the result of gross violation of the technology of treatment (exaggeration of the norms for expenditure, a leak in the bar, poor operation of the mixing unit, etc.). This fall breach cannot be hidden in the spring — plantings appear to be striped. In those equipment passes where a great deal of preparation fell, there are no weeds but the winter crop is pale and weak. It is necessary to say that in recent years, incidents of improper use of simazin have become increasingly fewer. The personnel engaged in chemical weeding are well acquainted with the technology and approach the work with great responsibility.

It is pertinent here to dwell on residual effects of a herbicide--it is seen that simazin, applied in autumn, does not have a negative action, in spring, on clover which was sown in winter cultivations.

If for any reason, fall chemical weeding does not prove effective in isolated fields (an absence of soil moisture or, conversely, excessive rain washing away the preparation) the fields must be treated with herbicides from the 2,4-D group in the spring. The granular butyl ether of 2,4-D applied early in the spring along with mineral fertilizers is most effective against unscented chamomile, blue cornflower and chickweed.

[520-9003]

9003
CSO: 1840

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COTTON PREDECESSORS AND WILT

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 p 24

[Article by F. A. Babayev, professor, Azerbaijan Scientific Research Institute of Cotton Production, and O. G. Mamedov, junior scientific associate]

[Text] Various agrotechnical methods that make it possible to disrupt the relationship between an agent and host plant have major significance in increasing the resistance of cotton to wilt and suppressing infection. During 1973 - 1978, we studied the effectiveness of various predecessors of cotton in controlling wilt. The experiments were run in laboratory (in lysimeters) and field conditions (in fields of the Azerbaijan Scientific Research Institue of Cotton Production).

Lucerne, clover, winter peas, rye, sorghum, corn, rape, onions, garlic, oats, wheat and barley were used as predecessors. Continuous plantings of cotton served as a control. The size of the lysimeter was 90 X 60 X 50 cm, the capacity was 200 kg of soil and the bottom was open. Soil for the experiment was collected from areas with a provocative wilt background and were additionally infected with oats (100 grams per lysimeter) contaminated with the Kirovabadskiy strain of the agent thereby creating a highly infectious load.

In each lysimeter there was a group of 8 plants of the S-4727 variety. Nitrogen and phosphorus fertilizers were applied at the rate of 5 grams per plant on 3 dates (before cultivation, at the two-three leaf stage and at the bud stage). There was a four-time repetition of the tests. Onion appeared to be the best predecessor. The vulnerability of cotton planted after it appeared considerably later (15 August), overall damage declined by 60.1% in comparison with continuous planting of the crop, the number of diseased plants was reduced by more than half and almost none were severely affected. The plants were better developed and provided a better yield (29.9 grams from a single plant with 11.4 grams in the control). Garlic did not fare quite as well as onions. In both instances, there was soil improvement, apparently as a result of phytocides.

In the variants where the predecessors were corn, sorghum and rape, morbidity during the first cotton planting dropped by 43.2 - 51.4% (control - 81.4%).

The cotton yield following corn and sorghum equalled 26 - 29.7 grams from a single plant. The significant decline in vulnerability to wilt in this instance can be explained by the fact that the vegetable residues from corn, sorghum and rape activate the replication of useful microorganisms in the soil, including those that are antagonists to wilt.

In a cultivation and field experiment, it was shown that cotton-lucerne rotations are one of the most suitable and economically useful techniques making it possible to improve the soil and drastically reduce cotton morbidity from wilt.

In the lucerne bed, during the second and third years after it had been plowed up, cotton was affected by wilt at the rate of 17.2 - 27.4% while with continuous planting, the rate was 45.8%; the yield of raw cotton increased by 6, 4.7 and 1.8 centners/hectare (in the control with continuous planting, it was 16 centners/hectare). During the third year after the lucerne was plowed, there was an increase in the susceptibility of the fields to wilt. However, by planting intermediate green manure crops such as clover, winter peas and others during this period, it was possible to end the increasing morbidity of cotton in the fields where it was sown the fourth and fifth years after the lucerne had been plowed up.

In 1976, in production conditions at the kolkhoz imeni Nizami in the Kasum-Ismaylovskiy rayon, the effectiveness of barley, wheat and corn as predecessors to cotton was tested on 40 hectares. In the fields, cotton morbidity from wilt dropped by 37.9% after corn in comparison to the control (64.9%); that is, the technical effectiveness of this method was 58.4%. It should be noted that during the first growing season (before 1 August), the cotton did not suffer from wilt at all although the control plants were affected at the rate of 30.7%. The degree of disease development in this variant was also lower than in the control which is indicative of a partial diminution of the pathogen's parasitic properties.

Winter wheat and barley were good predecessors for cotton to control wilt. However, they are lower in effectiveness than corn. Thus, after barley, the cotton was affected at the rate of 43.5% and 51.9% after wheat.

When cotton was grown after corn, barley and wheat, the yield of raw cotton was 25.5, 24.3 and 23.9 centners/hectare, respectively (the control was 22.9). The increase in crop yield was basically determined by an increase in the number of bolls and the weight of raw material from a single boll.

Thus, when it is not possible to use cotton-lucerne rotations to control wilt, it is necessary to plant corn, wheat or rye as intermediate crops.

In recent years on the cotton producing farms of Azerbaijan, the area of onion plantings has been expanded. This makes it possible to use this crop as an intermediate in a cotton rotation in some areas. The high level of onions' effectiveness against wilt in production conditions was confirmed in 1976 at the kolkhoz imeni Ordzhonikidze in the Agdamskiy rayon.

Cotton-lucerne crop rotations were introduced in the republic on 260,000 hectares in 1980. With the proper selection of a predecessor to cotton, it is possible to sustain wilt resistance for a longer period of time for promising new as well as industrial varieties and as a result of this, to insure production of a high yield of raw cotton in fields contaminated by wilt.

[502-9003]

9003
CSO: 1840

UDC 632.982

A TECHNIQUE FOR RECOVERING DROPS OF ATOMIZED EMULSION

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 p 34

[Article by D. G. Skalov, A. P. Skorikov, S. G. Morozov, N. R. Il'kun]

[Text] A number of techniques for recovering drops of atomized liquid for the purpose of determining their dispersion composition are well known. Each of them has its own advantages and disadvantages. However, a problem that has heretofore been given no consideration has been encountered in our research; with the dispersion of an emulsion, it was necessary to determine not only the size of the drops but also the concentration of the oil phase (in the butyl ether form of 2,4-D, for example) of each of them. These data have become necessary in conjunction with the use of coarsely-dispersed emulsions in which the content of the oil phase in separate drops can vary sharply with atomization.

Determining the individual concentrations of the emulsion in drops can also be of general interest by making it possible to assess the evaporation of water from them during the time span from atomization to recovery.

Initially we attempted to resolve this problem by calculating and measuring the oil particles in each drop with a subsequent conversion to the total volume. With capture of the drops in an immersion liquid, this type of operation is feasible in principle but practically speaking, it is not workable due to the high level of labor intensiveness.

After a prolonged search, it has been possible to find a technique that greatly simplifies the issue. A clean glass surface is coated with a uniform thin layer of 20 - 30% aqueous solution of OP-7 emulsifier. After the applied layer has dried, a film 3 - 5 µm thick remains on the glass in which the drops are trapped. When an entrapped drop evaporates, a process fixed in an applied kinogram takes place. In proportion to the reduction in the drop's diameter, all oily particles are drawn towards the center; at the moment of total evaporation of the water, they coalesce while forming a single oily meniscus. At the same time, a convex cingulum deposited by the emulsifier which becomes a gelatinous substance here is left around the original perimeter of the drop. For a drop with a diameter of 100 µm, the process ends 4 - 5 days after the drop has been deposited.

Drops with diameters of from 30 to 450 μm were studied in our experiments. Within this range, the flow coefficient does not show a significant correlation with the size of the drop and is 2.69 for the outer cingulum and 2.44 for the oily meniscus. Thus, in each of the drops that were examined, it was enough to measure the two diameters; the concentration of emulsion in a given drop is determined by the formula

$$C = (1.1 \frac{d_m}{d_k})^3 ,$$

where d_m and d_k are the diameters of the meniscus and cingulum respectively. The cingulum is retained without visible changes for a period of 10 days. A striking evaporation of the oily meniscus is noted after 5 - 6 days during which the measurements must be taken or microphotographs made. This time limitation applies totally to the recovery of oily preparations.

It should be noted that the technique described is not suggested in place of the technique recommended in accord with OST 70.6.1-74; it is intended to solve a special problem: to find the distribution not only of drop sizes but also the charges of preparation contained in them. The forms of these two distributions generally do not coincide since falling drops lose water at differing rates.

[502-9003]

9003
CSO: 1840

UDC 634.982.4

IMPROVING THE PERFORMANCE OF THE AN-2 AIRCRAFT

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 p 9

[Article by V. M. Petrenko, A. B. Yevdokhimov, scientific associates of the VNIIPANKh GA [Expansion unknown]]

[Text] In the chemical weeding of plantings, it is especially important that all treatments be carried out within a brief period of time and all the techniques that increase the productivity of labor are necessary here.

One of the reserves for increasing production is reducing the standards for water use in spraying operations. VNIIPANKh GA, in cooperation with the All-Union Scientific Research Institute of Hygiene, Toxicology, Pesticides, Polymers and Plastics, the All-Union Scientific Research Institute of Chemical Substances for Plant Protection, the Kazakh SSR Scientific Research Institute for Agricultural Chemicals and the Kustanayskaya Agricultural Test Station have proposed the aerial technique of UMO [ultra-small-volume spraying] which uses 2,4-D. One kilogram of the butyl ester (butapone) or 2 kg of the amine salt are diluted with water to make 6 liters and applied to a hectare of winter or spring wheat during the tillering stage.

During 1979, this new technique was tested in production conditions in Kazakhstan and the Krasnodarskiy Kray. Dicotyledonous weeds were almost totally (95-100%) eradicated from plantings of spring wheat on 30,000 hectares at the "Krasnodar'skiy" sovkhoz and on 20,000 hectares at the "Kenbidaikskiy" sovkhoz in the Tselinogradskaya oblast with this technique while the grain yield was the same as with the use of 25 liters/hectare, that is, 18-20 centners/hectare. Similar results were also obtained on other farms where UMO tests were run.

In excess of 82,000 hectares in the Northern Kazakhstan oblast, including plantings at the "Voskhod," "Zhdanovskiy," "Yubileynyy," "Internatsional'nyy" and "Viktorovskiy" sovkhozes, were treated with this technique. Eradication of rhizomatous-stolonaceous weeds was 87-94% or approximately the same as with a liquid expenditure rate of 25-50 liters per hectare.

In Krasnodarskiy Kray, 2,4-D herbicides were applied to plantings of winter wheat at the "Leninskiy put'" kolkhoz in the Tikhoretskiy rayon and the kolkhoz imeni Kalinin in the Dinskiy rayon on 6,500 hectares. The technical effectiveness was 87-95% while the grain yield averaged 36.7 centners/hectare (with standard spraying, the yield was 34.5 centners/hectare).

Extensive production testing of this technique has demonstrated that the performance of the AN-2 aircraft improves by a factor of 1.5 - 2. Thus, V. I. Ponomarev's crew have weeded 2,500 - 2,800 hectares daily at the "Krasnoyarskiy" sovkhoz while with the traditional spraying technique, it weeded only 1,200 - 1,400 hectares. The average rate per flying hour was 274 hectares. Another crew, that of V. I. Starovoytov, treated 45,700 hectares of spring wheat plantings at the "Voskhod" and "Zhdanovskiy" sovkhozes with the new technique with an average production rate of 241.4 hectares/hour.

It is important to note that 90% of the fields treated with the new technique have been recognized as farms with an "excellent" rating. With this technique, the number of workers at the operations points involved in making up the solutions and transporting water has been significantly reduced.

When the AN-2 aircraft is used for chemical weeding, a great deal depends on flight scheduling. Studies by VNIIPANKh GA and other institutions have shown that when the speed of the AN-2 is educed to 145-150 km/hour (instead of the 160 km/hr previously recommended) and the flap angle is 5°, there is a more efficient use of the slipstream energy behind the aircraft. This makes it possible to improve the uniformity of herbicide dispersion over the area being treated, to cut chemical waste and to increase the density of droplet coverage on the plants. As a result, the performance rating of the aircraft increases by an average of 17-22% and the quality of the spraying process is improved.

In 1979, production testing of the new flight program was done in the Tselinogradskaya, Severo-Kazakhstanskaya, Kustanayskaya, Kokchetavskaya, Uralskaya and Dzhambulskaya oblasts on 2.4 million hectares. The average production rate for the AN-2 aircraft was 168.3 hectares per hour with an expenditure rate of 25 liters per hectare.

According to reports from the farms, spraying efficiency with an operational coverage swath of 40 meters was no less than that employing the previously used technique (aircraft speed of 160 km/hour without using flaps and a swath width of 30 meters).

Thus, the enumerated techniques make it possible to perform the operations at the best possible agrotechnical times with a high degree of technical and operational efficiency.

Introduction of the UMO technique in 1980 has been proposed in Kazakhstan for not less than 1 million hectares and for almost 50,000 hectares in the Krasnodarskiy Kray. We are developing technology using new flight techniques for the AN-2 aircraft on 8 million hectares in Kazakhstan, the Ukraine, the Northern Caucasus and the Volga region.

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DETERMINATION OF CHLOROORGANIC AND SOME ORGANOPHOSPHORUS PESTICIDES

Moscow VETERINARIYA in Russian No 11, 1980 pp 62-64

[Article by O. A. Malinin, Ukrainian Scientific Research Institute of Experimental Veterinary Science]

[Text] The system of extraction and preparation of samples for analysis vary significantly when identifying pesticides in different media. Among the relatively universal methods should be noted the sulfuric acid method of purification to establish chloroorganic pesticides, proposed by M. A. Klisenko. However, this method has specific disadvantages related to the use of sulfuric acid. This method is unacceptable for purification of extracts in identification of organophosphorus (FOS) pesticides.

Taking the foregoing into account, we developed a method of extraction and purification which can be used in identification of chloroorganic and some FOS (GKhTsG [Hexachlorocyclohexane], heptachlor, GPKh-epoxide, DDT, DDD, DDE, keltane, dilor, TKhM-3, trolene, dibrom, bromophos, methaphos, methylnitrophos, abat, diazinone, koral, phozalone and phthalophos) in most biological objects. The high degree of purification permits concentration of the extract to a small volume and to use it both for gas and thin-film chromatography. Acetone of brand ChDA or KhCh is used as the extracting agent. Some lots of acetone, especially of brand Ch, may contain impurities which interfere with identification of the preparations; therefore, each lot must be checked accordingly (for reactive agents).

Extraction of Pesticides

From root crops, tubers, vegetables and green plants. An average specimen of the sample (sugar beets, potatoes or carrots--up to 20 grams, cabbage, cucumbers and apples--up to 10 grams and grass--up to 3 grams) is carefully pulverized and 30 ml of acetone is poured over it. The sample is extracted on a shuttle apparatus for two hours or 10-16 hours with periodic mixing. The extract is filtered through a funnel with a 50-milligram cotton tampon. The residue in the retort and the filter are flushed with 15 ml of acetone. To the combined extract is added 15 ml of bidistilled water and 2 ml of a 20 percent solution of basic lead acetate in 5 percent acetic acid (the pH of the lead acetate solution is brought up to 5.4-5.6 prior to use with 10 percent caustic soda solution). The mixture is placed into a refrigerator at 0°C for one hour and the solution is then poured into cooled centrifuging beakers and centrifuged for three minutes at 3,000 rpm. If needed--when there are solid particles on the surface of the liquid--it is additionally

filtered through the funnel with a cotton tampon. Ten ml of 10 percent acetic acid and 75 ml of bidistilled water are added to a separatory funnel with the supernatant liquid. The pesticides are re-extracted from this mixture three times by hexane, using 10 ml of it each time. The combined hexane is washed with 20 ml of 5 percent aqueous solution of acetone and filtered through a funnel with a layer of anhydrous sodium sulfate into an evaporating dish (a tampon of 50 mg of white cotton is inserted into the upper constricting part of the funnel 5 cm in diameter, a layer of 1.5 cm ahydrous sodium sulfate is poured on it and it is washed with 7 ml of n-hexane). The filter is washed with 5 ml of hexane after completion of the work.

A total of 200 mg of aluminum oxide and 200 mg of KSK silica gel (the KSK or KSS silica gel are treated and pulverized by methods generally accepted for thin-film chromatography) are added to the evaporating dish. The hexane is evaporated in an exhaust hood. The pesticides are washed out of the dry residue in the dish with 7 ml of a mixture consisting of three parts benzene and one part hexane. To do this, 3 ml of the mixture is initially added to the dry residue in the dish and stirred 1 min. with a glass rod. The supernatant liquid is filtered through a funnel with a layer of anhydrous sodium sulfate into measuring test tubes (a tampon of 30 mg of white cotton is placed into the upper constricted part of the funnel 3 cm in diameter and a 0.75 cm layer of anhydrous sodium sulfate is poured in and the funnel is flushed with 5 ml of hexane). The residue in the dish and the filter are washed two more times, using 2 ml of the mixture each time.

From grain, fodder, mixed fodder and hay. Up to 10 grams of pulverized grain and fodder, 5 grams of mixed fodder, 2 grams of straw and 1 gram of hay are taken for the investigation. The pulverized sample is mixed with an equal amount of bidistilled water and 30 ml of acetone is poured in. The extract is then filtered and the residue and filter are again flushed with 15 ml of acetone. The combined extract is processed similar to the method described above.

From milk and blood. Thirty ml of acetone is added to 10 ml of milk. The mixture is carefully mixed for 30 minutes. The extract is filtered and the residue and filter are washed with 15 ml of acetone. The combined extract is treated by the method described for root crops.

From tissues of animals and some livestock products. A sample of tissues (10 grams of muscle, 5 grams of liver and kidney, 5 grams of sour cream and 4 grams of egg yolks) is carefully pulverized and 30 ml of acetone is poured in. After completion of extraction, the sample is placed into a refrigerator for one hour, then filtered and the residue is washed with 15 ml of cooled acetone. The combined extract is treated by the method described for root crops.

If an emulsion forms during reextraction of the water-acetone solution with hexane, one proceeds in the following manner: the emulsion and the hexane are washed with a 5 percent aqueous solution of acetone, poured into a small 100-ml flask and 10 grams of anhydrous sodium sulfate added to this. The separated hexane is decanted into an evaporating dish, while the residue in the retort is washed with 15 ml of hexane, which is decanted into the same evaporating dish.

From butter and fats. Two grams of fat or butter are ground in a mortar with a glass pestle and quantitatively transferred to a retort for extraction. Thirty ml

of acetone is added to the sample and it is extracted for 10-16 hours, then filtered and the residue and filter are washed with 15 ml of acetone. Fifteen ml of bidistilled water and 2 ml of a lead acetate solution are added to the combined extract. The mixture is placed into a refrigerator for one hour and is then centrifuged. The fat remaining in the supernatant liquid is separated by filtration or by using a separatory funnel. All the work is then carried out according to the method described for root crops.

From drinking water. Thirty ml of acetone and 10 ml of 10 percent acetic acid are added to 80 ml of water. The mixture is extracted with hexane according to the method described for root crops.

From urine. The urine is diluted with 2.5 percent acetic acid at the rate of 1:1. Thirty ml of acetone and 2 ml of a 20 percent lead acetate solution are added to 20 ml of this urine. The samples are then treated according to the method described for root crops.

The purified extract is used to identify pesticides by gas or thin-film chromatography. The extract can be concentrated to 2 ml for gas-chromatographic identification of pesticides with a constant recombination rate detector (the Tsvet-106 chromatograph). Up to 5-10 microliters of the purified extract are added to the chromatograph evaporator. Glass columns one meter long, filled with chromatone containing 5 percent CE-30 or 5 percent DS-550 are used for the analysis. The temperature of the evaporator, column and detector is 220, 200 and 230°C, respectively. Chloroorganic pesticides and some FOS--GKhTsG, heptachlor, GPKh-epoxide, keltane, dilor, DDT, DDD, DDE, TKhM-3, trolene, dibrom, bromophos, methaphos and methylnitrophos--are identified in this case.

The enzymatic agar-diffuse method of A. A. Nepoklonov and V. K. Metelitsa (1971) or the thin-film chromatographic method of O. A. Malinin (1979) are used to identify FOS. To do this, the purified extract is evaporated, having added 50 mg of anhydrous sodium sulfate to it. The residue is mixed with 0.5-1 ml of alcohol. The alcohol solution is used according to the recommended methods. One should bear in mind that the extract purified by our method can be used to identify pesticides with some other methods as well.

The recommended method was checked in investigation of various biological objects: potatoes, sugar beets, carrots, cabbage, apples, tobacco, grass, grain, mixed feed, animal tissues and livestock products. The extract was purified sufficiently well in all cases and was suitable for gas chromatographic investigation.

Analysis of the control specimens of different tissues of vegetable and animal origin, which contain a known quantity of pesticides, showed that the average identifiability and accuracy of the method in identification of preparations by the gas chromatographic method comprises 81.1 ± 9.7 percent for GKhTsG, 71.2 ± 9.5 percent for heptachlor, 72.9 ± 9.0 percent for keltane, 77.1 ± 9.2 percent for DDT, 73.2 ± 10.4 percent for DDE, 69.3 ± 8.7 percent for dilor, 76.6 ± 10.1 percent for dibrom and 75.3 ± 10.2 percent for bromophos. When identifying the remaining FOS by the thin-layer chromatography method with antienzyme developer, approximately 70 percent of the introduced quantity was detected.

The developed method was used to identify pesticides in the tissues of animals poisoned experimentally with heptachlor and keltane.

Pesticide residues were found in all tissues upon examination of the tissues of rabbits which received heptachlor at a rate of 2 mg/kg of body weight 5 times per week for 1.5 months. The amount of heptachlor epoxide comprised 0.31-0.51 mg/kg in the muscles of the rabbit 48 hours after the last administration of the preparation, it comprised 0.47-0.94 mg/kg in the kidneys, 2.3-3.8 mg/kg in the liver and 18.8-22.5 mg/kg in the fat. Heptachlor itself was found in the form of traces.

Two metabolites were found besides the toxic chemical itself when identifying keltane residues in the tissues of experimental animals. Metabolite No. 1 is similar to DDE in its chromatographic properties and metabolite No. 2 is similar to DDT. The ratio between the amount of keltane in the tissues and its metabolites depended on the doses of the preparation and the periods of its administration. Thus, whereas 12-18 mg/kg of the preparation was found in the fat 48 hours after administration of keltane to rabbits in a dose of 2 mg/kg of body mass, 12-36 mg/kg of metabolite No. 1 was found and 3-10 mg/kg of metabolite No. 2 was found, it was not detected in the tissues of rabbits within 21 days. The amount of metabolite No. 1 increased to 20-40 mg/kg and the amount of metabolite No. 2 was 3.6-10 mg/kg.

It was established that keltane is secreted with the milk of sheep not only during administration of the preparation, but also for a long time after the use of it is stopped. Keltane residues were also detected in all tissues of sheep which received 1 and 5 mg/kg of body mass daily. A significant amount of keltane and its metabolites were detected in lambs produced from these sheep (40-85 mg/kg in the fat).

Our recommended method of determining chloroorganic and some organophosphorus pesticides can be used both in scientific research and in production laboratories. This method is especially useful when investigating "unknown" samples. It permits immediate exclusion or identification of a large group of chloroorganic and organophosphorus pesticides in the sample, a significant reduction of the set of reactive agents, their number and labor expenditures.

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THE EFFECT OF T-2 TOXIN ON CHICKEN PRODUCTIVITY

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[Article by V. A. Trufanova, Ukrainian Scientific Research Institute of Poultry Breeding]

[Text] A marked toxic effect on the organism of chickens and geese as a whole and specifically on their egg production is typical for toxic trichothecins treated with Fusarium sporotrichiella and F. tricinctum, specifically for T-2 toxin, which causes a reduction of egg-laying and cessation of it within several days in chickens (G. M. Speers et al, 1977) and in geese (M. Palyusik et al, 1975). A marked species difference in the sensitivity to the indicated toxin--chickens are more resistant than geese--is noted.

Cases of T-2 toxicosis in laying chickens are described in which egg-laying was reduced and the shell became thinner (R. D. Wyatt, 1975).

In experimental T-2 toxicosis of laying hens, T-2 toxin in a concentration of 4-20 micrograms/gram of feed caused typical necrotic lesions of the mouth cavity and tongue, reduction of mass, egg-laying and deterioration of the quality of the egg shell.

It became necessary in this regard to identify the maximum permissible amounts of T-2 toxin in the feed for different species-age groups of poultry. The purpose of this paper was to study the effect of different concentrations of T-2 toxin in the rations on the productive qualities of laying hens during the initial period of egg laying.

T-2 toxin in the crystalline state with melting point of 149°C was produced from a 30-day culture on millet of the toxic strain Fusarium sporotrichiella at the Ukrainian Scientific Research Institute of Poultry Breeding; its identity to the specimen of T-2 toxin which we received from H. R. Burmeister (United States) was established by colleagues of the Khar'kov Scientific Research Chemical-Pharmaceutical Institute V. I. Chernobay and N. F. Komissarenko.

The experiment was conducted in the summer on chickens of the leghorn breed, which were maintained in colony houses on the floor. The 180-day-old pullets were formed into six groups of 10 chickens each prior to the beginning of egg laying, which were maintained for one month on a ration of the following composition: 25 percent corn, 29 percent wheat, 10 percent barley, 4.5 percent oats, 8 percent nutritional yeast, 6 percent sunflower seed meal and 8 percent fish and meat-bone meal.

T-2 toxin was included in the ration of five groups of birds at the rate of 0.5, 1, 2, 4 and 8 micrograms/gram of feed at 210 days of age when egg-laying exceeded the 50 percent level (the difference in egg laying between groups was statistically unreliable). To do this pure crystalline T-2 toxin was dissolved in ethyl alcohol and carefully mixed initially with 1-2 kg of mixed feed and then with the main mass of mixed feed. The mixed feed was fed after evaporation of the alcohol. The clinical state of the chickens, body mass, egg-laying and mass of eggs were taken into account throughout the experiment.

It was established that inclusion of T-2 toxin in the ration of the experimental birds caused toxicosis, which was manifested by necrosis in the mouth cavity and a reduction of egg-laying, egg mass and body mass. There was no death of the chickens in the experimental and control groups throughout the experiment.

Necrotic foci in the mouth cavity were noted by the end of the first week of the experiment in chickens maintained on a ration with 2, 4 and 8 micrograms/gram of T-2 toxin. The degree of their markedness was a direct function of the toxin concentration in the ration. Thus, weakly marked individual necrotic foci on the mucosa of the beak were noted in birds maintained on 2 microgram/gram of toxin. Birds which received 4 and 8 micrograms/gram of T-2 initially displayed yellowish-white superpositions along the edges of the beak slit and then individual oval necrotic foci 1-2 mm in size on the mucosa of the lower beak near the corners of the mouth and on the tongue papillae were noted. No visible disturbances in the mouth cavity were detected in the control group and in groups with 0.5 and 1 microgram/gram of T-2 in the ration.

It should be noted that necroses were not a permanent symptom of T-2 toxicosis throughout six weeks in the given experiment; they disappeared by the end of the second, fourth and fifth weeks, respectively, in groups with 2, 4, and 8 micrograms/gram of T-2 in the ration.

The development of necrotic lesions on the mucosa of the mouth cavity are regarded as one of the typical symptoms of T-2 toxicosis of poultry. In experiments of D. M. Speers et al and R. D. Wyatt et al (1977 and 1975), necroses were noted in groups of chickens which were given 8, 16 and 20 micrograms/gram of T-2 toxin each; necroses were not observed in a concentration of 4 micrograms/gram. These authors also do not take into account the disappearance of necroses. The reasons from this may be the short period of the experiment (three weeks) and the higher concentrations of T-2 toxin in the feed (16 and 20 micrograms/gram).

It was established that during the week prior the experiment, egg-laying in the groups was in the range of 52.5-67/5 percent. g-laying increased by 0.7-18 percent in control chickens and in chickens which received 0.5, 1, 2 and 4 micrograms/gram of T-2 during the first seven days of the experiment, but the differences among the groups remained statistically unreliable in the level of egg-laying as prior to the experiment; egg-laying decreased significantly (by 17 percent; < 0.05) in chickens of the sixth group (8 micrograms/gram of T-2) compared to the control group.

It should be noted that an increase of egg-laying at 6-9 months of age is typical for leghorn chickens. Egg-laying in all the groups increased during the second

week of the experiment, but a marked difference in the levels of egg-laying of the groups which received 0.05 and 1 microgram/gram of T-2 (78.5-87.1 percent) and in chickens which were given 2, 4 and 8 micrograms/gram of T-2 toxin (62.8-70.0 percent) was determined by the end of the second week. Egg-laying remained within the range of 78.5-88.5 percent during the third-sixth week of the experiment in groups which received 0.5 and 1 microgram/gram of T-2 toxin.

Egg-laying decreased throughout the third and fourth weeks in chickens with 2 micrograms/gram of toxin in the ration and was significantly lower than in the control group ($P < 0.001$), after which it again began to increase and reached 74.2 percent within six weeks, which did not differ from the level of egg-laying of the control groups ($P > 0.1$). Egg-laying decreased continuously and reached 45.7 and 44.2 percent, respectively, by the end of the experiment in groups of chickens which were given 4 and 8 micrograms/gram of toxin, which is significantly less than that of the control groups ($P < 0.01$). The given data on egg-laying as a whole correspond to the results of the experiment of M. G. Chi et al (1977), in which T-2 toxin in a concentration of 2, 4 and 8 micrograms/gram caused a decrease of egg-laying. However, there was a statistically reliable decrease of egg-laying only in the presence of 8 micrograms/gram of toxin in the named paper.

The egg mass in all groups increased from 51.7-52.5 grams (the beginning of the experiment) to 54.7-59.3 grams (the end of the experiment) throughout the experiment, which is typical for leghorn chickens 6-9 months of age. The egg mass of control chickens and those which received 0.5 micrograms/gram of T-2 increased uniformly and no reliable difference was established between the egg mass of these two groups of chickens throughout the experiment.

The egg mass was considerably less (2-4, 1-6, 1-5 and 2-6 weeks of the experiment, respectively) in chickens whose feed contained 1, 2, 4 and 8 micrograms/gram of T-2 toxin than in control chickens and the group which received 0.5 micrograms/gram of toxin ($P < 0.05$). It was also noted that the egg mass varied intermittently with concentration of 8 micrograms/gram of T-2 and was considerably less than that of control chickens ($P < 0.01$).

A negative effect of T-2 toxin on the size of seven-month-old chickens was established. The body mass increased by 160, 130, 60 and 90 grams, respectively, in poultry which was given 0, 0.5, 1 and 2 micrograms/gram of toxin; it decreased by 5 grams in both cases with concentration of 4 and 8 micrograms/gram.

Thus, feeding chickens for six weeks with feed containing 0.5 micrograms/gram of T-2 toxin causes no clinical symptoms of toxicosis and does not lead to a significant reduction of their productivity. The least concentration of T-2 toxin in the feed which has a negative effect on chickens is 1 microgram/gram. A decrease of egg and body mass is noted in this case. Necroses developed in the mouth cavity, egg-laying decreased and the egg and body mass also decreased in chickens maintained on 2, 4 and 8 micrograms/gram of T-2 toxin in the feed.

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METHODS OF DETERMINING THE MUTAGENIC ACTIVITY OF PESTICIDES

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[Article by T. P. Kalmykova, All-Union Institute of Experimental Veterinary Science]

[Text] A unified system of tests has now been developed to establish the activity of chemical mutagens in which methods are used which take into account the entire range of mutations occurring in somatic and embryo cells due to the effect of chemical substances. They include the following mutations: gene (replacement of bases, deletions, insertions and inversions), chromosomes (deletions, translocations, inversions, duplications and associations), genome (aneuploidia and polyploidia) and mitotic combinations. N. P. Dubinin and A. P. Akif'yev (1970) point out that the ratio of mutations is determined in each specific case by the specific nature of the object and the effect of the mutagen on it. In some cases gene mutations may considerably exceed structural mutations and vice versa.

Four methods are now used to determine the enumerated mutations: 1) consideration of gene mutations in microorganisms, 2) analysis of gene mutations in "host-averaging" experiments, 3) induction and consideration of dominant lethal mutations and 4) determination of mutagenicity by the frequency of chromosome aberrations in somatic and sexual cells of animals and man.

Consideration of gene mutations in microorganisms is the primary preliminary analysis of the mutagenic activity of pesticides. Auxotrophic mutants Escherichia coli, Salmonella typhimurium and Neurospora crassa are usually employed for this purpose and the frequency of biochemical mutations in them are determined (for example, las or lys reversions).

The appearance of prototrophic revertants indicates that the chemical substance is a mutagen. In this case the bacterial suspension (approximately 10^8 bacterial cells) is sown into an agarized minimum-enriched medium and circles of filter paper treated with the pesticide are placed on bacterial grass (F. Mukai, 1970). Thus, by determining the induced mutations in the ad-3 system, the test microbe of which is the heterocaryon of the neurospore, heterozygotic by ad-3A and ad-3B loci, one can establish that if the mutation touches one of two loci, the new mutant requires adenine for its development and accumulates red-purple pigment. Therefore, ad-3 mutations can be detected by the red tint of the colonies (F. J. de Serres, 1970).

The simplicity and ease of investigations permits one to rapidly analyze the mutagenic activity of a large number of pesticides. However, the results of these investigations do not yield an adequate answer for transfer of the data to man and animals since microbes have no system of detoxication and metabolism inherent to mammals.

Analysis of gene mutations in "host-averaging" experiments makes it possible to take into account the metabolic transformations of the objects under investigation in the animal organism. For example cyclophosphan introduced into the cell culture did not increase the frequency of chromosome aberrations, but after it was injected into rats their blood plasma induced numerous aberrations upon addition to the culture. "Activation" of the cyclophosphan was also observed after its incubation with liver sections and in the presence of microsomal fractions of it (K. Hampel et al, 1966; K. E. Hampel et al, 1969).

To determine the capability of pesticides to induce gene mutations in microorganisms, the latter are introduced into the abdominal cavity of the animal subject to the effect of the chemical compound under investigation. Sal. typhimurium, E. coli, Saccharomyces cerevisiae and others are used as the indicator strains of microorganisms. The frequency of the resulting mutations is established in microbes isolated from animals within a specific time interval, comparing them to the frequency of the initial strain. The formation of biologically active substances from the introduced chemical compound in the host organism is determined by this method.

The "activation" in vitro systems, in which the investigated substance is incubated with indicator strains of microorganisms in the presence of cofactors and homogenates or microsomal fractions of different organs of mammals, are now used extensively. This method combines high sensitivity of the microbes with the effect of the internal medium of the organism and its complex systems of metabolism.

The method of dominant lethal mutations is used to determine the mutagenic activity of pesticides on embryo cells. Dominant lethals are manifested in reduction of the number of generations obtained from mice and rats treated with the chemical substance. This method takes into account those mutations which cause the death of embryos during the earliest stages of development as a result of chromosome and genome rearrangements and significant chromosome disbalance (aneuploidia and translocations) which cause death of the zygotes before and after implantation.

To determine the dominant lethal mutations after completion of pesticide introduction, experimental and control males are bred to intact females at the rate of one male to three females. The animals stay together for 7-10 days, after which the males are bred to new females. Breeding is accomplished so that male gametes participate in impregnation which are in the following stages at the moment the pesticide takes effect: mature sperm from the epidydimis (1st-10th day of impregnation), spermatid (11th-20th day), late spermatocytes (21st-28th day), including cells in different stages of meiotic division, average spermaocytes (28th-35th day), early spermatocytes--sexual cells which have passed through the stage of quiescent spermatocytes and which are entering the prophase of meiosis (35th-42nd day) and spermatogonia (within three months after the pesticide takes effect). The females are dissected on the 15th-17th day of pregnancy, counting the number of corpus lutea, the number of points of implantation in the womb and live and dead embryos.

The following indicators are taken into account to analyze the frequency of induced dominant lethal mutations (dl): the survivability of embryos--the fraction of surviving zygotes, postimplanation death of embryos--death after implanation, and preimplantation death--the fraction of dead zygotes, embryos and unfertilized eggs. Induced postimplantation death comprises the dominant lethals in percent. The given method permits one to determine the stage of disruption of spermatogenesis and the fertilizing capability of sperm upon exposure to pesticides.

The most widespread and most accessible is the cytogenetic method of taking into account chromosome rearrangements in somatic and sexual cells of man and animals. It can be carried out both in vivo and in vitro on a large number of animals and can be extrapolated to some degree to mammals and man. Although this method does not permit one to take into account gene mutations, according to a number of authors there is a high correlation between the capability of chemical compounds to cause chromosome breaks and gene mutations (W. Nichols, 1977; N. Kil'man, 1966).

The chromosome aberrations taken into account by using cytological analysis are an indicator of the general mutagenic activity of the substance and permit one to judge the lethal disturbances of chromosomes which lead to sharp changes of cellular metabolism. There is a threat to the health of animals and man in any case of chromosome damage and this may be the cause of abortions, defects of development and hereditary diseases.

The cytogenetic method is based on obtaining metaphase preparations of chromosomes from somatic and sexual cells of animals and on cytological analysis of disturbances of the structure and number of chromosomes which change due to the effect of chemical compounds entering the mammal organism.

Preparation of metaphase chromosome preparations provides: a) introduction of colchicine into the animal organism or cell culture for accumulation of dividing cells at the metaphase stage, that is, at the stage of mitosis when the chromosomes are more suitable for cytological analysis. Colchicine blocks the division spindle at the metaphase stage and causes hyperspiralization of the chromosomes; and b) treatment of the cells with a hypotonic solution which causes swelling of the cell membrane and "straightening" of the chromosomes. Hanks' solution with distilled water, a 0.56 percent potassium chloride solution, 0.95 percent sodium citrate solution and others are used as the hypotonic solution; and c) fixation of the cells in which vital processes are rapidly interrupted, but the fine structures of the cell remain unchanged. A mixture consisting of three parts methyl alcohol and one part glacial acetic acid is used as the fixing fluid (the fixing effect of methyl alcohol is based on driving off the water and irreversible denaturation of the protein and the acetic acid penetrates the cell rapidly, precipitating and increasing the contrast between the cytoplasm and the nucleus). Dyes specific for DNA such as azure-eosine after Romanovskiy, acetocarmine, acetoorcein, lactoacetoorcein and others are used for staining.

Cytological analysis of disruptions includes microscopic study and analysis of chromosome aberrations. The former is carried out by means of a light microscope with an immersion system. A metaphase plate meeting the following requirements is selected under low magnification (10 X 20 X 2.5): a) all chromosomes are clearly stained and uniformly distributed; b) there are no random chromosomes in the visual field; c) the metaphase plate is round; d) the level of spiralization should

be such that acrocentric chromosomes are in the form of formal chromosomes under low magnification rather than in the form of points; e) transverse superposition of the long arms of the chromosomes is permissible; and f) all chromosomes are arranged in the same plane.

Structural disturbances of chromosomes in somatic cells are divided into two classes: chromosome and chromatid. The former occur when the cell is treated with a mutagen at the G-1 stage when the chromosome is represented by a single chromatid filament. They are found in the metaphase plate in the form of paired acentric or point fragments, acentric rings, ring chromosomes and symmetrical and asymmetrical interchromosome translocations. The latter appear upon exposure to the mutagen at stage G-2 when each chromosome consists of two chromatids; therefore, chromatid aberrations are manifested in the form of single damage: acentric fragments, exchanges of chromatid origin, breaks in the centromer and chromatid and isochromatid gaps.

Genome changes of a number of chromosomes are characterized by aneuploidia and polyploidia, that is, by a decrease or increase of diploid level for two-three chromosomes or multiple enlargement of the entire set.

Mutations which occur in somatic cells are not transferred by heredity, but nevertheless they cause serious changes in the organism: they cause death of cells and cause pathology of them. The relationship of mutagenic and carcinogenic activity of chemical compounds has now been established by the papers of many investigators (N. P. Dubinin, 1975; E. Miller and J. Miller, 1971; B. Ames et al, 1974 and others).

Cytological analysis of meiotic chromosomes is carried out at the stage of diakinesis-metaphase-1, that is at the stage when they are more suitable for analysis. The indicated investigations permit one to detect translocations, univalents and fragments. Deviation from the ordinary number of bivalents indicates the possible disturbance in meiotic chromosomes. Thus, symmetrical translocations are quadrivalents having the shape of a ring or chain and consisting of two or more bivalents; univalents are chromosomes unconjugated for one or another reason and fragments occur when the chromatid is damaged. Mutations in sexual cells are transmitted from generation to generation, leading to abortions, sterility, deformities and various hereditary diseases.

It should be noted that spontaneous disturbances of chromosomes (mutations) in somatic and embryo cells of healthy animals occur constantly due to the effect of external and internal factors of the medium and are characterized by single chromatid breaks and problems which usually comprise from 2 to 5 percent. An increase of the number of cells with fragments (breaks), gaps and the appearance of other types of disturbances of the structure or number of chromosomes due to the effect of a chemical compound compared to the control level indicates that the substance under study is a mutagen.

Thus, the indicated methods of analyzing the mutagenic activity of chemical compounds, including that of pesticides, permit one to determine all types of quantitative and qualitative disturbances which occur in the hereditary apparatus of the cell and which are of important significance in the pathogenesis of undesirable genetic consequences.

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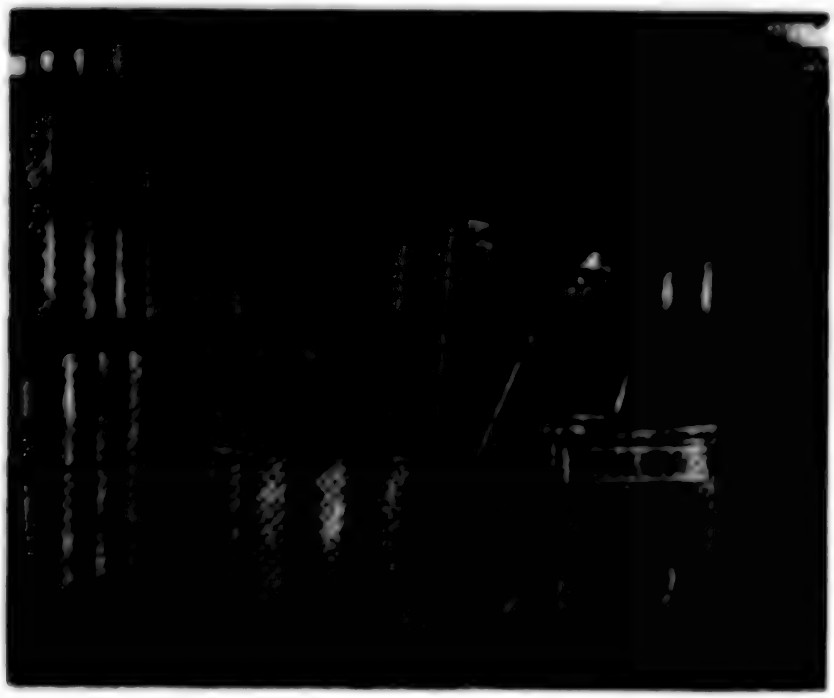
IMPROVING PESTICIDE SUPPLY

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 pp 10-11

[Article by A. B. Fratkin, chief, Pesticide Division of the "Soyuzsel'khozkhimiya" Association]

[Text] In proportion to specialization and concentration in agricultural production, changes in the structure of planted areas associated with this and the introduction of industrial technology into agronomy, the needs of kolkhozes and sovkhozes for plant protection resources are growing and the demands placed on the agricultural supply service for chemical products to include pesticides are increasing.



The establishment of a unified agrochemical service within the nation will undoubtedly contribute to increasing the effectiveness of chemicalization in agriculture and to a more efficient use of existing resources. In addition, the association "Soyuzkhimzashchita" is taking all measures not only to fulfill the annual and quarterly plans for pesticide deliveries but also to accelerate the implementation of capabilities to produce new preparations.

One of the basic tasks of the supply service

of the "Soyuzsel'khozkhimiya" association is optimum satisfaction of agriculture's need for pesticides in both volume and assortment. As we know, the task of accelerating the rate of production and supply of highly effective resources of plant protection has been decreed by resolutions of the March (1965) plenum of the CPSU Central Committee.

In 1965, there were 79 agricultural preparations available of which 33 are no longer in use and are considered obsolete in principle. Specifically, all the inorganic and a number of the chloro- and phosphoro-organic insecticides including DDT have been dropped. In 1979, deliveries of pesticides to kolkhozes and sovkhozes doubled (in terms of active substance) in comparison with 1965 and the assortment was expanded to 107 preparations (38 insecticides and acaricides, 19 fungicides and seed dressings, 37 herbicides and 13 fumigants, zoocides, nematicides, limacides and defoliants). The assortment of insecticides and acaricides has been bolstered with phosphorus-containing preparations of contact (phthalophos, metathion, phosalon and others) and systemic (Bi-58, anthio) actions as well as insecticides from other groups of chemical compounds (sevin, thiodan) and acaricides to set up a system of rotation (kelthane, acrex, plictran, omayt). Today's fungicides include both the traditional inorganic compounds of copper and sulfur as well as modern organic substances of contact (the dithiocarbamates such as zineb, cuprozan, polycarbacin) and systemic (fundozole) actions. Among the seed dressings, in addition to TMTD, copper trichlorophenolate and granosan, there are now combination preparations such as phenthiuram, hexathiuram and pentathiuram. The selection of herbicides has particularly grown. Along with the 2,4-D preparations, herbicides to treat plantings of corn (simazine, atrazine, eradicane, agelon and others), rice (propanide, saturn and others), sugar beets (sodium trichloroacetate, dichloral urea, phenazone, betanal, lenacil, eptham), cotton (kotoran, dalapon), flax (metaxon), vegetables (tetral, propachlor, rideon, semeron) and other crops are being supplied to agriculture. Over the period noted above as a whole, the assortment of pesticides has been expanded by 61 new preparations, that is, reduplicated by more than 50%.

Nevertheless, in spite of the obvious quantitative and qualitative increase in supplies, the needs of kolkhozes and sovkhozes for chemical resources of plant protection remain unsatisfied. The activation of new capabilities to produce a whole series of pesticides is anticipated. Production is planned for chloro-organic insecticides based on lindane instead of technical grade hexachloran, dilor, which is a highly effective preparation against the beet weevil and Colorado beetle, hexachlorobutadiene which is effective against grape philloxera, a number of phosphoro-organic insecto-acaricides, fungicides, nematicides and herbicides to combat 2,4-D resistant weeds in grain plantings as well as wild oats, bitter weed and other rhizomatous-stolonaceous weeds and to treat fields of soy, sunflowers, potatoes and other crops. Production of sodium trichloroacetate needed not only to treat sugar beets but also to control weeds in plantings of long-fiber flax and other agricultural plants will be expanded as will that of the defoliant and dessicant magnesium chlorate.

In what direction should the work directly involved in supporting agriculture with the chemical resources for plant protection be improved? It is possible

to distinguish three basic interrelated stages here: the planning of deliveries, the organization of storage and the realization of resources. Here, it is particularly necessary to stress that supplying pesticides at all these stages has its own essential characteristics as a result of the specific purpose and properties of these preparations as well as the seasonal nature of agricultural operations.

The planning of deliveries includes determining the needs and allocating reserves of pesticides among consumers. In contrast to all other material-technical resources, the demand for pesticides can vary over the course of an operational season and, consequently, can change from year to year. Likewise, the use of insecticides, fungicides and zoocides depends on the distribution and development of pests and crop diseases within a given year. The need for seed dressings can increase during a particular season if relatively large areas are subject to reseeding of various crops as a result of unfavorable weather conditions. Rainy weather during the tillering period of grasses can limit the use of the 2,4-D herbicides which results in an increase in resources carried over to the following year. Drought during the spring season can reduce the effectiveness of soil herbicides and create the need for repeated treatments during the growing season (especially in plantings of sugar beets). Heavy rainfall during the pre-harvest period prevents the use of the necessary volumes of defoliants and dessicants (as was the case in 1977, for example, when rain did not permit widespread application of dessicaants in sunflower plantings).

In a setting of constantly changing phyto-sanitary conditions leading to the inconsistent use of pesticides, serious problems frequently arise during the preparation of plans for their annual requirements, not to mention similar plans for future use. Nevertheless, the diagnostic and forecastic service has at its disposal data from many years as to the distribution of pests and diseases in the various natural-agricultural zones of the country as well as information as to the volumes of protective chemical measures taken against them. These data make it possible to regionalize the nation's territory according to the distribution of pests and to forecast volumes of chemical treatment. Comparing numerous years of data against the annual forecast aids in establishing more accurately the level of chemical control for the impending year as well as for future years. A determination of areas for chemical weed control must be based on collation maps of weediness in agrarian lands. This will make it possible to define the required assortment and volume of herbicides more effectively.

When orders are made up into plans, only the norms for the rates of chemical use recommended for a given zone should be used. In addition, within the "Selkhozkhimiya" associations, a strict accounting of the intake and supply of pesticides should be made so that reliable data on carry-over reserves of chemicals will be available when amending the requirements at the beginning of the plan year. Unfortunately, actual requirements for pesticides are frequently not shown in the association's orders. This occurs because of the fact that either reduced carry-overs of pesticides or elevated norms for their rates of use are used in accounting. The whole point is that orders for the year being planned are initially made up in February and March a year in advance based on tentative data as to pesticide carry-overs. True, they are updated after six months

although where accounting is poorly organized, the association is not in a position to make the figures more precise. It is quite clear that eliminating the shortcomings noted is a necessary condition for determining the optimum requirements for pesticides.

We will examine only one of a number of questions associated with the distribution of reserves. Consistent with the centralized supply procedure, the All-Union association, "Soyuzsel'khozkhimiya" allocates reserves based on requirements as stated directly by the "Soyuzsel'khozkhimiya" associations of the union republics which, in turn, apportion them to the oblasts (krays) and they to the rayon associations. In addition, within the "Sel'khozkhimiya" system, reserves of pesticides are being established, expenditure of which will also take place within the centralized procedure. However, individual farms and organizations often direct requests for a number of preparations to be allocated to republic associations for them or to "Soyuzsel'khozkhimiya" while bypassing the appropriate local rayon or oblast (kray) associations assigned to examine such questions. Therefore, in order to support development according to the plan, during the allocation of reserves of chemical resources it is necessary to conduct extensive research into the procedure for centralized pesticide supply to agriculture.

Organization of storage. Chemical resources for plant protection need to be stored in the standard depots of the "Sel'khozkhimiya" system which have self-contained areas to handle combustible and other groups of chemicals and which are equipped with various devices for loading-offloading work and warehouse operations. First of all, this type of procedure provides for the safe storage of pesticides and secondly, it makes it possible to concentrate the great bulk of them into vast depots while opening up broad opportunities to shift existing resources about depending on the phyto-sanitary circumstances. It is extremely important to create conditions for the quantitative and qualitative preservation of pesticides. Experience has shown that the stability of these preparations is largely dependent on their preparative form. Thus, if we compare the two basic commercial forms -- wettable powders and concentrates for emulsions, then, without question, the powders are more stable. Based on this reasoning, it is important that such widely used preparations as chlorophos, metaphos, carbophos, kelthane and certain others be produced only in the form of wettable powders. This will completely eliminate the need for the aluminum flasks and steel boxes in which the pesticides are shipped and thereby the expenses associated with collecting and returning the empties to the suppliers. The All-Union association "Soyuzkhimzashchita" must study this problem carefully and resolve it.

The realization of chemical resources for plant protection is the final stage in this operation. Acting as the supplying and marketing organization, the "Sel'khozkhimiya" association receives pesticides from chemical enterprises and supplies them to kolkhozes, sovkhozes and other consumers. The chemical industry as a whole fulfills the annual plans of the suppliers. However, there are also enterprises which are not fully utilizing existing capabilities to produce pesticides (phthalophos, zineb, metaxon, for example). Individual suppliers work sporadically while tolerating a non-uniform supply of chemicals

over the course of a year, frequently curtailing deliveries during the first six months and increasing them during the second. Agriculture, on the other hand, has a stake in receiving planned production during the first six months, that is, during the operational season. Pesticides to be delivered over the course of a year must be produced primarily within a period of 3 - 4 months.

According to existing procedures, the delivery of chemical resources to consumers must take place on highway transportation belonging to the "Sel'khozkhimiya" association during the period when protective measures are underway. Concerned that this will be difficult to accomplish in such a short period of time, some associations deliver preparations to the farms ahead of time. However, the truck fleet in the associations of "Soyuzsel'khozkhimiya" system is totally adequate to insure centralized delivery of chemical products to farms in time for the conduct of operations.

Resolving these practical problems will contribute to further improvement in the supply of pesticides to agriculture.

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PESTICIDE COMPATIBILITY

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 pp 32-34

[Article by K. A. Gar, doctor of agricultural sciences]

[Text] This article contains a discussion of chemical and biological compatibility as well as the advisability of combining various preparations. In production conditions, it is possible to utilize only those mixtures that are included in the "List of Chemical and Biological Resources to Control Pests, Plant Diseases and Weeds Authorized for Use in Agriculture". We ask that all data as to the effectiveness and safety of new pesticide combinations as well as recommendations for their incorporation into the "List" be directed to the State Commission for Chemical Resources to Control Pests, Plant Diseases and Weeds under the USSR Ministry of Agriculture (107113, Moscow, ulitsa Lobachika 17/19).

At the present time, combined chemical treatments simultaneously directed against no single harmful objective but against a complex of them are being utilized on an increasingly extensive basis.

It is not advisable to produce many forms of prepared combination ingredients since they cannot be stored for long periods of time and only rarely is it necessary to use two active elements immediately. Therefore, the majority of mixtures are made up on-site prior to treatment or they are used as "bulk mixtures." However, it is by no means feasible to mix all pesticides. Their compatibility depends on a number of factors including the number of active ingredients, emulsifying agents, fillers and stabilizers that may not be compatible and which, as a result, may separate, coagulate, break down or form products that burn the plants.

Abiotic factors and the individual propoerties of the crop or even the variety can be of major significance. As a rule, warm, damp weather is more favorable for the manifestation of phytocidal properties in pesticides although occasionally in drought conditions (when the moisture content of the soil reaches critical values), the spraying of fruit or arboretum plantings can induce an unanticipated massive leaf drop. Where there is any doubt, it is recommended that a test treatment be made with the combined mixture on isolated branches

or plants to be observed for one - three days for any signs of burning (leaves may drop later on).

When preparing to work with a combination mixture, it is necessary to have a clear understanding of why the mixture is needed.

Mixing preparations is expedient when an additional effect might be obtained or when several different types of pests will be destroyed simultaneously and the number of treatments diminished. For example, mixing coddling mothicides with fungicides to control scab or other diseases is advisable as is mixing fungicides to control scab with mildewicides, specific acaricides (kelthane, tedion and others) and phosphoro-organic insecticdes when the first treatment is applied late, acaricides and fungicides or insecticides for the simultaneous destruction of mites, insect pests and disease agents.

Mixing is advisable when a combined preparation can provide an additional synergistic effect against pests or disease agents.

It is not acceptable to mix:

— the organic fungicides captan, zineb*, polycarbacin* and elemental sulfur with mineral-oil emulsions (the mixture can cause leaf burn);

— copper oxychloride, chlorine-containing (PCK, pentachlorophenol, hexachloran preparations), phosphoro-organic (metaphos, carbaphos) insecticides and sevin with preparations that contain lime or an alkali (in this mixture, the pesticides break down and burn the leaves);

— preparations containing soap with those that contain lime (insoluble calcium salts form and the emulsion coagulates);

— polysulfide preparations with preparations that are not compatible with lime or elemental sulfur.

Combining insecticides with herbicides must be approached with a great deal of caution so as not to cause harm or even the death of crop plants.

Insecticides and the majority of fungicides can be mixed with biopreparations based on bacillus thuringiensis (in the sprayer tank immediately prior to use).

Top-dressing with preparations that contain borax, magnesium, manganese, iron or zinc should be done separately; these compounds should not be mixed with pesticides. Iron sulfate which is used to counteract chlorosis is not mixed with insecticides and fungicides. Chelated organic compounds of iron can be combined with most preparations (including those with lime) with the exception of ziprex, bordeaux liquid and lime-sulfur spray. Urea does not combine with

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* At present, information is becoming available on increasing the effectiveness of zineb, polycarbacin and some other wettable fungicide powders with addition of 0.5 - 1% emulsions of non-phytocidal oil to the active mixture.

A) Инсектициды и акарициды		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
		B) Инсектициды и акарициды																						C) Фунгициды														
1	Акрекс (изофен)		+[1]	•	+	+[4]	•	+[2]	+[5]	+[5]	+[4]	•	−	•	•	−	−	+[3]	•	•	•	•	−	−	−	•	−	−	−	•	•	•	•	−	+[2]	•	+	1
2	Антио. фосмамид (БИ-58)	+[3]		•	0	+	0	+	0	0	0	•	+	•	•	•	+[2]	+	+[2]	0	•	•	•	+	−	•	+	+[4]	−	+	•	+	+	+	+	−	•	2
3	Базудин	•	•		+	+	+	+	0	+	+	•	+	+[4]	+	0	+	+	+	•	•	•	•	+	−	•	+	+[3]	•	•	•	+	•	•	+	+	+	3
4	Бензофосфат (фозалон)	+[4]	0	+		+	0	+	0	0	0	•	+	+	+	0	+[4]	+	+	0	•	•	0	+	•	•	+	+	−	+	+	+	+	+	+	+	+	4
5	Гексахлоран, γ изомер ГХЦГ, аналоги ДДТ	+[4]	+	+	+		+	+	+	+	+	+[4]	+[4]	+	+	+	+[2]	+	+	•	+	+	•	+	+[3]	•	+	+[2]	−	+[2]	+[2]	+[2]	+	+	+[2]	+[2]	•	5
6	ДДВФ	•	0	+	0	+		+	+	0	0	•	•	+	+	•	•	•	+	•	•	+	•	+	−	•	+	+	−	+[2]	•	+	•	+	+	+	−	6
7	Кельтан (хлорэтанол, Акарол)	+[4]	+	+	+	+	+		+	+	+	+[4]	+	+	+	+	+[4]	+[4]	+	+[4]	+	+	+[4]	+	+	•	+[2]	+[2]	−	+	+	+	•	+	+	+[2]	+[2]	7
8	Карбофос	+[4]	0	0	0	+	+	+		0	0	•	+[4]	+	+	•	+[4]	+	+	•	0	+	0	+	−	•	+[2]	+[2]	−	+	+	+	•	+	+	+[2]	−	8
9	Метафос	+[4]	0	+	0	+	0	+	0		0	•	+	+	+	•	+[4]	+	+	•	0	+	0	+	−	•	+[4]	+[4]	−	•	•	+	+	+	+	•	−	9
10	Метилмеркаптофос	+[4]	0	+	0	+	0	+	0	0		•	+[4]	+	+	+	+[4]	+	+	•	0	+	0	+	−	•	+	+	−	+	+	+	+	+	+	+[5]	−	10
11	Метилнитрофос (метатион)	•	0	•	•	+[4]	•	+[4]	•	•	•		+[4]	•	•	•	−	•	•	•	•	•	•	•	−	•	•	•	−	•	•	+[2]	•	+	+	•	+	11
12	Нафтилкарбамат (севин)	−	+	+	+	+[4]	•	+	+[4]	+	+	+[4]		+	+	+[4]	−	+	+	•	+[4]	•	•	+	−	•	+[4]	+	−	+	+	+	+	−	+	+	+	12
13	Омайт	•	•	+[2]	+	+	+	+	+	+	+	•	+		+	+	−	+	+	•	+	•	•	+	−	•	+[2]	+[2]	−	•	•	+	•	+	+	+	•	13
14	Пликтран	•	•	+	+	+	+	+	+	+	+	•	+	+		+	−	+	+	•	+	+	•	+	•	•	+	+	−	•	•	+	•	•	+	+	•	14
15	ПХК, ПХП	−	•	0	0	+	•	+	•	•	+	•	+[4]	+	+		•	+[4]	•	•	•	+[4]	•	•	−	•	•	•	−	•	•	−	•	+[4]	+[5]	+[2]	−	15
16	Препараты №30, 30А, 30М, летнее масло	−	+[4]	+	+[4]	+[3]	•	+[4]	+[4]	+[4]	+[4]	−	−	−	−	•		+[4]	•	−	+[4]	−	•	+	−	•	−	−	−	+	•	−	•	+	+[1]	•	−	16
17	Тедион	+[4]	+	+	+	+	•	+[2]	+	+	+	•	+	+	+	+[4]	+[4]		+[4]	+[4]	+	+	+[4]	+	+	•	+	+[2]	+[2]	+	+	+	•	+	+	+[2]	+	17
18	Тиодан	•	+[4]	+	+	+	+	+	+	+	+	•	+	+	+	•	•	+[4]		•	+	•	•	+	−	•	+[4]	•	−	+	•	+	•	+	+	+[2]	+	18
19	Трихлорметафос-3	•	0	•	0	•	•	+[4]	•	•	•	•	•	•	•	•	−	+[4]	•		•	•	0	+[4]	−	•	+	•	−	+	•	+	•	+	+	•	•	19
20	Фталофос, гардона (винилфосфат)	•	•	•	•	+	•	+	0	0	0	•	+[4]	+	+	•	+[4]	+	+	•		•	0	+	−	+	+	•	−	+	•	+	+[4]	•	+	+	+	20
21	Хлорофос	•	•	•	•	+	+	+	+	+	+	•	•	•	+	+[4]	−	+	•	•	•		0	+	−	•	+	•	−	+	+	•	+	•	+	•	+	21
22	Этафос	−	•	•	0	•	•	+[4]	0	0	0	•	•	•	•	•	•	+[4]	•	0	0	0		[illegible]	−	•	−	−	−	[illegible]	[illegible]	•	•	−	+	•	•	22
	D) Фунгициды																																					
23	Бенлат	−	+	+	+	+	+	+	+	+	+	•	+	+	+	•	+	+	+	+[4]	+	+	[illegible]		−	•	+	+	•	+	+	+	+	•	+	+	+	23
24	Бордоская жидкость	−	−	−	•	+[3]	−	+	−	−	−	−	−	−	•	−	−	+	−	−	−	−	−	−		−	−	•	−	+[5]	+[2]	+	−	0	+[4]	−	−	24
25	Делан	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	+	•	•	•	−		•	•	−	•	0	+	•	+	•	•	+	25
26	Каптан, фталан	−	+	+	+	+	+	+[2]	+[2]	+[2]	+	•	+[4]	+[2]	+	•	−	+	+[2]	+	+	+	−	+	−	•		+	−	+	+	+	+	+[4]	+	+	+	26
27	Каратан	−	+[3]	+[3]	+	+[2]	+	+[2]	+[2]	+[2]	+	•	+	+[2]	+	•	−	+[2]	•	•	•	•	−	+	•	•	+		−	+	+	+	•	•	+	+	+	27
28	ИСО	−	−	•	−	−	−	−	−	−	−	−	−	−	−	−	−	+[2]	−	−	−	−	−	•	−	−	−	−		−	−	0	−	−	−	−	−	28
29	Поликарбацин	•	+	•	+	+[2]	+[2]	+	+	•	+	•	+	•	•	•	+	+	+	+	+	+	[illegible]	+	+[2]	•	+	+	−		0	+	+	+	+	+	+	29
30	Полимарцин	•	•	•	+	+[2]	•	+	+	•	+	•	+	•	•	•	•	+	•	•	•	+	[illegible]	+	+[2]	•	+	+	−	0		+	+	•	0	+	+	30
31	Сера смачивающаяся и коллоидная	•	+	+	+	+[2]	+	+	+	+	+	+[2]	+	+	+	−	−	+	+	+	+	•	•	+	+	+	+	+	0	+	+		+	+	+	+	+	31
32	Топсин-М	•	+	•	+	+	•	•	•	+	+	•	+	•	•	•	•	•	•	•	+[3]	+	•	+	−	•	+	•	−	+	+	+		•	+	+	+	32
33	Хлорокись меди	−	+	•	+	+	+	+	+	+	+	+	−	+	•	+[4]	+	+	+	+	•	•	−	•	0	+	+[4]	•	−	+	•	+	•		+[4]	•	−	33
34	Цинеб	+	+	+	+	+[2]	+	+	+	+	+	+	+	+	+	+[4]	+[4]	+	+	+	+	+	+	+	+[4]	•	+	+	−	+	0	+	+	+[4]		+	+	34
35	Цинрекс (карпен)	•	•	+	+	+[2]	+	+[2]	+[2]	•	+[4]	•	+	+	+	+[2]	•	+[2]	+[2]	•	+	•	•	+	−	•	+	+	−	+	+	+	+	•	+		•	35
36	Эупарен	+	−	+	+	•	−	+[2]	−	−	−	+	+	•	•	−	−	+	+	•	+	+	•	+	−	+	+	+	−	+	+	+	+	−	+	•		36
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	

Key to chart:

A. Insecticides and acaricides
   1. Acrex (isofen)
   2. Anthio, phosfamid (BI-58)
   3. Bazudin
   4. Benzophosphate (phosalon)
   5. Hexachloran, γ-isomer HCCH, DDT analogs
   6. DDVP
   7. Kelthane (chloroethanol, dicophol)
   8. Carbophos
   9. Metaphos
   10. Methyl mercaptophos
   11. Methyl nitrophos (metathion)
   12. Naphthyl carbamate (sevin)
   13. Omayt
   14. Plictran
   15. PCK, pentachlorophenol
   16. Preparations No 30, 30A, 30M, summer oils
   17. Tedion
   18. Thiodan
   19. Trichlorometaphos-3
   20. Phthalophos, gardona (vinylphosphate)
   21. Chlorophos
   22. Ethaphos

   Fungicides
   23. Benlate
   24. Bordeaux liquid
   25. Delan
   26. Captan, phthalan
   27. Karathane
   28. Lime-sulfur spray
   29. Polycarbacin
   30. Polymarcin
   31. Wettable and colloidal sulfur
   32. Topsin - M
   33. Copper oxychloride
   34. Zineb
   35. Ziprex (carpen)
   36. Euparen

B. Insecticides and acaricides
C. Fungicides
D. Condition designators:

+ - mixing is acceptable
- - (minus) - mixing not acceptable
0 - mixing is possible but not advisable as preparations are similar in action
o - possibility of mixing has not been established and cannot be recommended

1 - first preparation may be mixed, no data for the second;
2 - wettable powder is recommended for mixing but not emulsion;
3 - leaves or fruit may be damaged in the event of unfavorable weather conditions or in sensitive varieties;
4 - mixing is possible but it is recommended that the quality of the mixture be tested and the mixture used on individual branches or plants prior to treatment;
5 - mixture is recommended for use immediately after preparation since prepared solution may vary in its physical or chemical nature during storage;
6 - mixture may be unstable and should be tested on individual branches;
7 - combined mixture is recommended with this exception (in citrus fruit against sucking pests, for example); to prepare it, it is necessary to mix carefully a powdered preparation with half the quantity of water dispensed gradually; pour the liquid into a tank and then mix the oil preparation with the remaining volume of water, pour into tank and mix

(the oil concentration in the mixture is up to 1 - 1.5%); test mixture on isolated branches to evaluate phytocidal action;

8 - second preparation may be mixed, no data for first;

9 - soap should not be added in combination.

lime-sulfur spray, karathane, sevin, acrex and certain phosphoro-organic compounds. It may be combined with other preparations but when used on fruit in this type of combination, the effectiveness of the pesticides frequently drops.

Growth regulating agents such as naphthalene acetic acid and naphthylacetamide combine with the organic insecticides and fungicides but not with highly alkaline preparations (lime-sulfur spray, lime, and so on) or nitrophenol derivatives (acrex) used in summer treatments. Tests are run on isolated branches to check the qualities and phytocidal effect of the mixtures.

Preparations based on gibberelic acid are compatible with most of the standard insecticides and fungicides.

Antibiotics are not recommended for use with bordeaux liquid and other alkaline preparations. A decline in the intensity of respiration has been noted in apple leaves treated with a mixture of streptomycin and captan, zineb or sulfur.

Proven findings as to the feasibility of mixing the most important insecticides and acaricides with fungicides or insecticides with acaricides are shown in the table. This refers only to mixtures that are compounded at the time the active solution is made up from ready-mix preparative forms or even "bulk mixtures". The use of combined mixes makes it possible to incorporate two or more treatments into one and achieve considerable savings of labor and resources.

Some preparations that have passed government testing but are not yet widely used domestically are included in the table. These are the insecticides bazudin, thiodan, the acaracidies and fungicides omayt, tedion, plictran, delan, karathane, topsin-M, ziprex and euparen. The ability to mix them with other pesticides has been demonstrated in materials from the firms and in published information.

Information as to the mixing of insecticides and fungicides with herbicides is not included in the table as these mixtures are used extremely rarely and the widely used mixtures of herbicides are shown in the "List of Chemical and Biological Resources".

The feasibility of mixing various herbicides together is the subject of a separate article.

Data from K. A. Gar's book "Insektitsidy v sel'skom khozyaystve" [Insecticides in Agriculture] (Moscow, "Kolos", 1974) and the brochure "Khimicheskiye sredstva zashchity sel'skokhozyaystvennykh kul'tur" [Chemical Resources for the Protection of Agricultural Crops] (Moscow, Rossel'khozizdat, 1978) were used in compiling the table while recommendations from V. I. Abelentsev and N. M.

Golyshin ("Zashchita rasteniy", 1976, No 2) were taken into account along with recommendations from foreign chemical firms and the journal "Farm Chemical".

[502-9003]

9003
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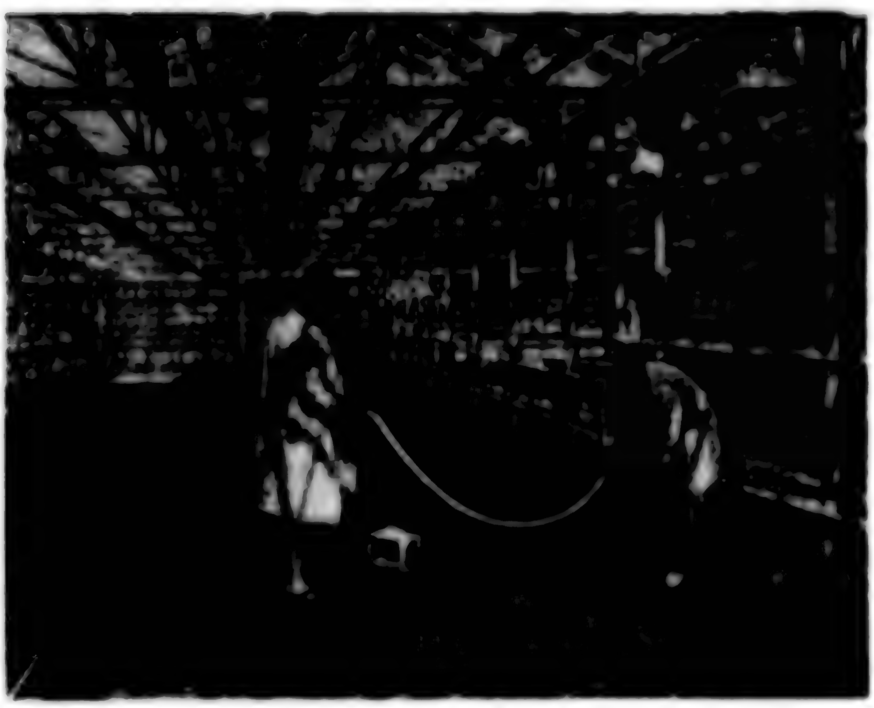
ATTACKING THE TMV

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 p 12

[Article by E. G. Shchelova]

[Text] The hothouse sovkhoz "Moskovskiy"... The green of tomato bushes is lost somewhere under the same cover. Huge, attractive fruit, already ripe but still gaining weight pull on the branches although the strong, lush green plants support the abundant load well.

The trained eye of a caretaker runs over the closest plants but finds no signs of tobacco mosaic infection characteristic for tomatoes in covered soil.



Vaccination of tomato seedlings in one of the hothouses of the "Moskovskiy" sovkhoz is done by L. G. Selezneva, assistant to the foreman of the 7th plant protection division and laboratory technician N. M. Novikova

There are no filamented mottled leaves, no fruit with rusty and green streaks or spots of necrosis. But generally, by the time to gather the harvest, the virus has left its marks on nearly every plant.

What is the secret of such enviable good health in tomato plants?

The answer to this question can be found in yet another hothouse in the sovkhos. Seedlings are growing here in small rectangular plots. The ages of the sprouts vary greatly: in one plot, sprouts are just appearing; in another, the dicotyledon leaves have opened; you won't be confused by the third -- the seedlings are already clearly tomatoes.

N. M. Novikova, a laboratory technician from the plant protection service and L. G. Selezneva, an assistant to the foreman of the division for plant protection fuss over their charges: the time to "inoculate" the seedlings reaching the stage of opened dicotyledon leaves has passed.

"Inoculation" is not a slip of the tongue; a vaccine -- a mildly pathogenic strain of virus which will protect tomatoes from rampant replication of the severely pathogenic tobacco mosaic virus which destroys up to a fourth and occasionally half the harvest yield has been administered to young plants of non-resistant varieties.

The vaccination technique is simple and readily available. Carborundum powder is poured into a beaker of water, the contents of an ampule of vaccine are dissolved in water and a portion of this mixture is added to the carborundum. The liquid is stirred and sprayed over the young plants with an ordinary household vacuum cleaner. Like needles on syringes, the carborundum particles prick the delicate leaflets and the vaccine penetrates the tissue. The primary requirement here as in the vaccination of man and animals is sterility of the instrument and the medium.

Seven to eight days later, the "patients" develop a unique immunity to the severely pathogenic strain of TMV.

What does vaccination of tomato varieties not resistant to TMV gain for farms? By the most conservative estimates, there is a 15 - 30% increase in the harvest yield, the fruit are superior in commercial qualities and the seed are healthy. And, when the savings are counted, they amount to an average of 10,000 rubles per hectare.

Addresses of institutions providing vaccine:

188620, Leningradskaya oblast,
City of Pushkin, 6, shosse Podbel'skogo,
3, All-Union Institute of Plant Protection,
Laboratory of Virusology

250007, City of Chernigov, 7, ulitsa Shevchenko,
93, Ukrainian Scientific Research Institute of Agricultural Microbiology,
Laboratory of Virusology

142784, Moskovskaya oblast, Leningradskiy rayon,
Sovkhoz "Moskovskiy",
Department of Plant Protection

[502-9003]

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VACCINATION OF TOMATOES

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 p 13

[Article by I. F. Kuznetsova, senior agronomist and phytopahologist, Plant Protection Administration of the "Soyuzsel'khozkhimiya" Association]

[Text] Expanding the area of protected soil in various regions of the country and particularly in the non-chernozem region requires an intensification of the protection of the tomato crop against viral diseases and primarily against the tobacco mosaic virus (TMV).

This virus is widespread in hothouses and causes such harmful diseases as mosaic, streak, fern leaf and internal necrosis of the fruit. As a rule, during the winter-spring rotation, mosaic blight of tomatoes reaches 100% within 2-3 months while during the summer-fall rotation, this occurs after 1-2 months. Crop losses resulting from this can amount to 15-25% while losses from fern leaf and streak may reach 60%. The danger of TMV does not end here, however, as it has a detrimental effect on the seed and the commercial properties of tomatoes.

The causative agent is retained in the seeds, soil, in the water runoff and substrate, on equipment, crates, workers' clothing and the structures of hothouses.

The traditional means of protecting plants against viruses has been the derivation of immune or resistant varieties and hybrids. Work of this type is underway here although we do not as yet have any domestic varieties or hybrids resistant to TMV. Even prophylactic measures of control are not effective as the virus is highly resistant to unfavorable conditions and has a high degree of contagion.

At present, a new and effective means of protecting tomatoes against TMV is being introduced which involves vaccinating them with mildly pathogenic strains of the virus. Timely introduction of these strains (known as vaccinals or vaccines) into plants prevents the development of harmful diseases; that is, the plants in this instance acquire an immunity to the severely pathogenic strains of TMV.

In our country, the vaccine strain against the tobacco mosaic virus, later known as the S-7 strain, was produced at the All-Union Institute of Plant Protection by Professor Yu. I. Vlasov and T. Ya. Yakutkina. It was isolated in 1971 from symptom-free tomato plants in a field crop in the Lower Volga region and was used for practical vaccination in covered soil.

Another mildly pathogenic domestic vaccinal strain, V-69, was isolated in 1973 from tomato plants grown in a hothouse by a group of associates at the USSR Academy of Sciences Institute of General Genetics under the supervision of Professor K. S. Sukhov. Both strains have high levels of genetic stability.

The vaccination technique is simple and consists of a single spray application of vaccine to tomato seedlings at the cotyledon leaf stage. Household vacuum cleaners or ERV-1 electric vacuums are used for the treatment.

The contents of an ampule of pure preparation or sap from plants used as reservoirs of vaccine are dissolved in water according to directions on the ampule or accompanying instructions. For a more effective vaccination, carborundum (15 grams per liter) which hardens prior to use is added to the solution.

Seven to ten days after adminstration of the vaccine, the plants acquire an immunity to the severely pathogenic strains of TMV which is retained for a period of several months or essentially throughout the entire growing season of the tomatoes.

During the past few years in our country, this method of vaccination has been used successfully in a number of hothouse operations to protect the primary varieties and hybrids of tomatoes sensitive to TMV. This work has been underway since 1975 on more than 600 hectares and its scale is increasing.

Production of the S-7 vaccine strain has been refined at the All-Union Institute of Plant Protection and the Ukrainian Scientific Research Institute of Agricultural Microbiology while that of the V-69 has been developed at the "Moskovskiy" sovkhoz base under the supervision of virologists from the USSR Academy of Sciences Institute of General Genetics. Annual production of the vaccine is sufficient to treat all tomatoes being grown in the country in protected soil.

The S-7 strain is widely used on farms of the "Leto" firm ("Leningradskiy," "Kolpinskiy," "Molodezhnyy," "Tikhvinskiy," and "Vyborgskiy"), at the Kislovodskiy experimental hothouse combine, in Latvia and at a number of hothouse operations in the Ukraine; the V-69 strain is used on the "Moskovskiy," "Podmoskovnyy" and "Belaya dacha" sovkhozes, at the Kiev vegetable growing plant, the Vilnius hothouse combine and the "Yuzhnyy" Karachayevo-Cherkesskiy combine.

With vaccination, it is possible to achieve a 30% increase in the productivity of tomatoes with an annual savings of 10,000 rubles/hectare.

The All-Union Institute of Plant Protection first used this technique at the "Leto" firm in a system of seed production for hothouse tomatoes of the Leningrad Autumn and Leningrad Early varieties. Seed collected from vaccinated plants had good seed properties, its germination rate was 94.3% (86.5% among the control), sprouting energy was 85.5% (78.2% in the control); in addition, there were no undersized or deformed plants or plants with necroses (these are characteristic of plants with TMV blight).

At present, vaccination is successfully being used in varieties and hybrids of tomatoes not resistant to the TMV: the Leningrad Early, Leningrad Fall, Virovskiy Early, Izhorskiy, Ural'skiy Fruitful, Ukrainian Hothouse 285, Moscow Fall, Revermun,

Kubanskiy Trunk and others. Vaccination is dependent on Hybrids and varieties that contain genes resistant to TMV are not to be vaccinated; these should be set out separately from those that are not resistant.

The vaccinal strains are harmless for healthy persons working with them. Fruit containing tobacco mosaic virus is harmless to man.

The Scientific-Technical Council of the USSR Ministry of Agriculture examined and approved a draft "Recommmendation for the Use of Vaccinal Strains of Tobacco Mosaic Virus (TMV) S-7 and V-69 to Protect Tomatoes against Diseases Induced by TMV (mosaic, fern leaf, streak, internal fruit rot)" in November 1979. The recommendations were confirmed in April 1980 and distributed to hothouse operations for introduction.

The All-Union Institute for Plant Protection, the Institute of General Genetics and the Ukrainian Scientific Research Institute for Agricultural Microbiology have received recommendations to continue working on the vaccination technique and, specifically, to expand studies of the varietal reactions of tomatoes and the effect on the reaction of various ecological conditions as well as to test vacinnation on an extensive basis within a system of seed production, interpret the nature of interference and find new mildly pathogenic strains.

Service zones have been established for the scientific institutions producing the vaccine: for the All-Union Institute of Plant Protection, these are the North-Western, Volga-Vyatskiy, Northern Caucasus, Western Siberian and Eastern Siberian economic regions as well as the Latvian, Moldavian, Armenian, Georgian and Azerbaijan SSR's; for the Ukrainian Scientific Research Institute of Agricultural Microbiology, the service zones are the Ukrainian and Belorussian SSR's. For the "Moskovskiy" sovkhoz which is producing the vaccine under patent control of virusologists from the USSR Academy of Sciences Institute of General Genetics, the Central Chernozem, Central, Povolzhskiy, Ural'skiy and Far Eastern economic regions have been set as have the Lithuanian, Estonian, Kazakh, Kirghiz, Uzbek, Tajik and Turkmen SSR's, the Kiev vegetable growing plant and the "Yuzhniy" Karachayevo-Cherkesskiy combine.

Kolkhozes and sovkhozes involved in hothouse vegetable production can place orders for the vaccine at the appropriate regional centers.

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TESTING VARIETIES FOR RESISTANCE TO VIRUSES AND THEIR STRAINS

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 pp 27-28

[Article by A. L. Ambrosov, chief, Laboratory of Virusology, Belorussian Scientific Research Institute of Plant Protection, and Zh. V. Blotskaya, senior scientific associate]

[Text] Within the Belorussian SSR, the X-, S-, M-, and Y-viruses are the most widespread for potatoes. To a significant extent, they have also affected breed stock which makes it difficult to obtain resistant potato varieties within the republic. This task is further complicated by the diverse strain constitution of the viruses. In conjunction with this, during 1972-1979, we identified a number of the basic potato virus strains and studied their biological characteristics.

During 1977-1979, field resistance to known strains was studied among regionalized and promising varieties of potatoes in the republic. The tests were run as follows. One hundred tubers of each variety were planted in four rows which were alternated with rows of plants of the Temp variety that had been infected ahead of time with the various strains and test tubers that were 80 - 100% infected at the time of planting. An account of viral diseases was maintained throughout the stages of the plants' complete sprouting, budding and flowering and the 10 - 15 days after flowering through visual, serologic, indicator and electron microscopic techniques. It should be noted that the varietal specimens of potatoes used for the studies were first tested for the presence of viral infection by means of indexing in combination with the serologic and electron microscopic methods. Tubers of 18 varieties of potatoes relatively free of the X-, S-, M- and Y-viruses were selected for planting.

The results of the finished studies shows that even during the first year of cultivating plants in an infectious background, many of the varieties had a significant percentage of diseased plants. For example, during the flowering stage, the Belorussian Early had 51.7% of the plants affected by the X-virus; 10.7% were affected by the Y-virus; 46.5% were affected by the M-virus. During the second tuberous reproduction (a sequela to the infectious background of 1977-1978), the number of diseased plants had increased significantly in all the test varieties. There was an especially high percentage of viral infections (up to 97.6) among descendants of the Belorussian Early,

Novinka, Pokra, Ufimets, and Belorussian Starchy varieties. For this reason, these varieties were dropped from further testing.

Data based on the testing of varieties is shown in Table 1. It shows the varietal rate of infection during 1979 (response to the infectious background of 1977-1978). As may be seen from the table, the Prigozhiy, Loshitskiy and Lastochka varities proved to be less susceptible. The number of plants of these varieties affected by the X-virus did not exceed 30.5% during the testing process; the number affected by the Y-virus did not exceed 1.8%; the number affected by the M-virus did not exceed 28.3%.

A non-uniform varietal resistance to the various viral strains was established. For example, the Prigozhiy variety proved only mildly susceptible in relation to the X^1, X^3, Y^R and Y^2 strains but was severely affected by the X^2, M^2 and S^2 strains. The Lastochka variety showed high field resistance to the strongly virulent strains of the Y-virus (Y^R, Y^1, Y^2) as well as to the M^1 strain even though it was quite susceptible to strains of the X-virus. With the exception of Temp, all the varieties tested in field conditions were mildly affected by the Y^1 strain. In these varieties, the symptoms of viral disease were mildly expressed or absent altogether. This is indicative of resistance and tolerance to certain strains. The experimental data that we obtained in a study of the harmfulness of the strains to various potato varieties are a further confirmation of this (Table 2 presents data on the 3d tuber reproduction after contamination in 1977).

The Prigozhiy variety declined in tuber yield by 14.9 - 15.5% only when the plants were infected by strains of the Y-virus (Y^2 and Y^N). The other viruses and strains had virtually no

Table 1

Variety	Number of plants (%) affected														
	by the X-virus	including			by the Y-virus	including				by the M-virus	including		by the S-virus	including	
		X^1	X^2	X^3		Y^N	Y^R	Y^1	Y^2		M^1	M^2		S^1	S^2
Loshitskiy	29.5	24.0	0	5.5	1.5	1.3	0.2	0	0	28.3	28.3	0	11.8	11.8	0
Sadko	52.4	44.1	8.3	0	1.6	1.6	0	0	0	49.4	49.4	0	72.0	35.2	36.8
Komsomolets 20	68.4	49.1	16.9	0	15.5	12.5	0	0	3.0	62.0	59.2	2.8	34.1	34.1	10.7
Verba	46.0	19.7	11.0	15.3	5.0	1.5	0	0	1.6	31.0	10.4	19.6	32.0	0	32.0
Ivushka	59.0	48.2	8.4	2.4	3.7	2.3	0	0	1.4	49.9	49.9	0	48.5	42.8	5.7
Adretta	58.4	48.0	2.2	8.2	10.3	8.9	1.0	0	0.4	19.9	19.9	0	13.8	13.8	0
Prigozhiy	26.1	0	26.1	0	1.1	1.1	0	0	0	27.0	4.5	22.5	70.1	0	70.1
Lastochka	30.5	21.2	8.0	1.3	1.8	1.8	0	0	0	19.6	0	19.6	26.0	5.7	20.3
Temp	100.0	98.4	1.6	0	54.2	28.4	8.6	5.6	11.6	94.6	88.2	6.4	63.1	32.0	31.1

Table 2

Plants infected by strains	Average weight of tubers from 1 plant (grams, in numerator) and decline in weight in comparison to control (%, in denominator) for varieties			
	Loshitskiy	Prigozhiy	Lastochka	Temp
X^1	850 / 14.1	2180 / 7.2	962 / 17.5	1125 / 29.6
X^2	885 / 10.6	2240 / 4.6	980 / 15.9	1300 / 18.7
X^3	930 / 6.1	2300 / 2.1	1025 / 12.1	1565 / 2.1
Y^N	740 / 25.3	1980 / 15.5	820 / 29.6	920 / 42.5
Y^R	800 / 19.1	2280 / 2.9	900 / 22.8	1156 / 28.1
Y^1	820 / 17.1	2100 / 10.6	940 / 19.3	1317 / 17.6
Y^2	780 / 21.1	2000 / 14.9	880 / 24.5	1080 / 32.5
M^1	860 / 13.1	2200 / 6.4	910 / 21.0	1250 / 21.8
M^2	890 / 10.1	2260 / 3.8	950 / 19.3	1470 / 8.1
S^1	930 / 6.1	2300 / 2.1	1100 / 5.6	1285 / 19.4
S^2	950 / 4.0	2310 / 1.7	1120 / 3.9	1590 / 0.6
Control (healthy plants)	990 / 0	2350 / 0	1166 / 0	1600 / 0

effect on the harvest yield from plants of this variety (Table 2). In the case of the Lastochka and Loshitskiy varieties, there was a decline in the tuber yield when plants were infected by the X^1, Y^N, Y^R, Y^1, Y^2 and M^1 strains and the drop was more significant than for the Prigozhiy variety. The most significant losses in tuber yield, however (up to 42.5%) were noted in plants of the Temp variety with infection by all the test strains which is indicative of its strong susceptibility to viruses and the high level of risk in the strongly virulent viral strains especially for potato varieties not resistant to infection.

The completed studies make it possible to conclude that the Prigozhiy, Loshitskiy and Lastochka varieties have a greater field resistance to the X-, S-, M- and Y viruses and several of their strains and can serve as a starting point for selection of virus-resistant varieties. An evaluation of breeding stock is advisable not only for species of viruses but also for their strains since we have not found any overall field resistance to all viral strains.

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A PHYTOPATHOLOGICAL ASSESSMENT OF RICE VARIETIES

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 p 17

[Article by L. N. Kornilova, junior scientific associate, Primorskiy Branch, All-Union Scientific Research Institute for Rice, and V. F. Buryy, department director]

[Text] Of the pathogenic microflora in plantings of rice in the Primorskiy kray, the fungus Piricularia orizae is the most harmful. The epiphytotic piriculariosis that it induces (with varying degrees of disease development) recurs every 2 - 3 years as a rule and frequently reduces crop yield by 10 - 20%. The unique climate conditions of the kray are conducive to this with temperatures that are close to the ideal for the pathogen's growth, elevated humidity levels and frequent monsoon rains.

Selective genetics is the most essential of the techniques for control.

A study of rice resistance in natural conditions does not provide an adequate picture of the immunobiological characteristics of varieties, especially in mild disease years. Therefore, in order to evaluate the varieties and hybrids, we are using a somewhat labor-intensive although fairly accurate method of artificial infection in the setting of a field cultivation experiment.

We plant seeds in culture vessels with soil taken from a rice field. The contents of each vessel include 8 kg of air-dried soil and a mineral reserve of Pryanishnikov's mixture in which ammonium nitrate is mixed with a measured amount of ammonium sulfate.

We hold the plantings for 18 - 20 days longer than the mass planting in production sectors so that by the tillering stage for plants in the experiment in production plantings which are already at the point of emerging into the tube, it is easy to find the infection spots of piriculariosis on the leaves.

We place the vessels in rows in the rice field in specially prepared trenches so that their upper edge remains even with the average level of the field. We build temporary plank bridging between the rows of vessels.

Before sprouts appear, we routinely water the soil in the vessels to the saturation point; after the field has been flooded, irrigation is no longer needed.

We thin the sprouts that appear leaving 11 in each vessel which amounts to an average density of 350 plants per square meter.

Plants that have acquired 4 - 6 leaves are infected with spore material consisting of a population of the pathogen's races that parasitize regionalized varieties of rice. To do this, early in the morning on the day of inoculation, we cut off segments of leaves with infection spots in the rice plantings, place them in conical flasks and store them in a refrigerator until evening at 2 - 3°. In order to test viability here, we take several infected tissue specimens from each flask and prepare a suspension of conidia. We place the suspension on microscope slides with a nearly dry layer of agar-agar; the slides are set in Petri dishes on supports made of thin glass tubing and we pour 2 - 3 ml of distilled water on the bottom of each. We hold the dishes for 8 - 10 hours in a room or in an incubator at a temperature of 21 - 23° after which we check the viability of the conidia under a microscope (at low magnification).

We prepare the conidia suspension to infect the rice plants in distilled water immediately prior to inoculation. We determine the conidium titer by means of a Goryayev counting chamber (gamocytometer). The spore load is 100,000 viable conidia per vessel. We spray the plants with an aqueous suspension of the fungal conidia (10 ml per vessel) from an ordinary hand atomizer prior to sunset. After the inoculation process, we cover the vessels with polyethylene film which is left until morning.

The first symptoms of disease are noted on the seventh day after infection when fine infection spots appear on the leaves.

We rate the varieties and hybrids by their resistance to disease based on their reaction to infection and the intensity of disease development. In the first instance, we use the scale of Latterell and others (1960). The data obtained characterizes varietal susceptibility to the piriculariosis pathogens. We look twice at the intensity of disease development: before tasseling and during the stage of full ripeness. For this assessment, we use a somewhat modified Petrov scale (1970). Before tasseling, we take a reading on a 5-point scale: 0 points means that there are no symptoms of disease; 0.1 points indicates isolated spots; 1 indicates that spots cover up to 25% of the leaf area; 2 points indicate coverage of from 25 to 50% of the area; 3 points mean that in excess of 50% of the leaf area is covered and the plant will die.

During the stage of full ripeness, we use a 4-point scale.

The intensity of disease development (in percentages) is determined by the formula:

$$R = \frac{\sum(a \cdot b) \cdot 100\%}{n \cdot 3},$$

where $\sum(a \cdot b)$ is the sum of the products of the number of infected plants in points of infection corresponding to them; n represents the number of plants counted; 3 is the highest point on the scale.

Point	Form of piriculariosis	
	nodular	panniculate
0	No signs of infection	No signs of infection
1	Up to 1/4 of node circumference infected	Up to 25% of pannicle shoots infected
2	Up to 1/2 of node circumference infected	From 25 to 50% of pannicle shoots infected
3	All nodes infected. Plant falls	More than 50% of shoots infected, pannicles devoid of grain

Cultivating the plants of the varieties being tested in cultivation vessels in the conditions of a flooded rice field permits maximum equalization of the conditions of the plants' mineral nutrition and the use of natural microclimatic conditions favorable for subsequent reinfection.

During 1976 - 1979, we tested 70 new varieties. Those varieties in which the intensity of disease development did not exceed 1% are considered to be resistant to piriculariosis; those not exceeding 1 - 5% are considered mildly susceptible. As our studies have shown, among the varieties selected by the Primorskiy Branch of the All-Union Scientific Research Institute for rice, Novosel'skiy, Malysh, Tikhookeanets and Dal'Ros are the most resistant to piriculariosis.

The book shelf:

Pak, P. V., Luchina, N. N.: "Povysheniye ustoichivosti polevykh kul'tur k boleziyam" [Increasing the Resistance of Field Crops to Diseases], Minsk: Uradzhay, 1979, 136 pages, 7,000 copies, 30 kopecks.

In the general system of measures to control yield in field crops, the development of special techniques to reduce losses from disease is of great significance. This book provides recommendations on improving the resistance of field crops to diseases supported by the results of numerous years of research.

[502-9003]

9003
CSO: 1840

AT THE SECTION FOR AGRICULTURAL ENTOMOLOGY

Moscow ZASHCHITA RASTENIY in Russian No 9, Sep 80 pp 58-59

[Article by V. P. Sem'yanov, Zoological Institute, USSR Academy of Sciences]

[Text] Three hundred forty four delegates (giving 91 reports) took part in the work of the section and its topical session held within the framework of the VIII Congress of the All-Union Entomological Association.

Eleven reports were presented at the two plenary sessions. Professor I. D. Shapiro discussed the significance of resistant strains as one of the elements of integrated systems of plant protection in a setting of future intensification, specialization and concentration in agriculture. The role of forecasting the appearance and development of pests was covered in a report by Professor I. Ya. Polyakov that was read by L. P. Kryazheva. A report by Professor B. V. Dobrovol'skiy detailing the development of strategy and systems of measures for plant protection provoked a number of questions and a heated discussion. The author explained his largely controversial views on integrated control. P. Zayanchkauskas discussed the results of a study of the role of the parasitic Hymenoptera in the decline in the numbers of garden pests in Lithuania. Professor G. Sandler, president of the Polish Entomological Society reported new findings on biological means for controling caterpillars of the cabbage butterfly. V. P. Samersov covered the problems of integrated protection of grain crops against pests in Belorussia.

A thought-provoking and interesting report on the status and future of chemical techniques of pest control was given by A. A. Smirnova. She stressed that the strength of researchers concerned with the chemical technique is being directed so as to insure minimum pollution of the environment with pesticides. Use of the technique of systematic analysis to resolve certain entomological problems and especially forecasting, determining the thresholds of risk and the advisability of taking protective measures was discussed by V. I. Tanskiy and S. V. Vasil'yev. A report by V. V. Baturin and L. I. Baturina explained mechanisms of insect resistance to bacterial preparations. P. Zayanchkauskas, Yu. Valyukas, M. Babenskas and I. Miselyunena discussed insect immunity to bacteria while P. Kh. Kiskin and I. S. Lazar' covered the use and advantages of the perforated collation map technique to predict pests.

The greatest number of reports (29) was made to the subsection "Pests in Field Crops". It is especially important to mention presentations by V. I. Pisarenko on "Phytosanitary Aspects of New Technology in Grain Crop Cultivation" and M. D. Vronskiye on "Some Problems in Protecting Field Crops as a Result of the Introduction of Industrial Technology into their Cultivation". Four reports (from Z. A. Ragimov, B. M. Gorenshteyn, Sh. T. Khodzhayev and S. A. Zhuravskaya) dealt with various aspects of protecting cotton against harmful pests. A large group of reports (by M. F. Sannikova, Kh. P. Mamayev and S. N. Firsov, O. S. Krayevskaya, V. Ye. Kambulin and A. Kadirova, K. S. Razmadze, V. N. Gramm, M. D. Ilyenko and N. N. Gorbunova) was devoted to forage grass pests in various zones of the country while others touched on specific questions of the biology of various pests and their control.

The subsection "Pests in Vegetable Crops and Potatoes" heard 8 reports. Of these, it is possible to note the report of N. N. Kharchenko and N. V. Vilimaytis on a simulation model for predicting population numbers of the spring cabbage moth.

Unfortunately, there were no general reports to the "Agroecosystems" subsection and all presentations dealt with the dynamics of populations of various invertebrate groupings in agrocenoses.

Sixteen reports were made at meetings of the subsection "Pests in Perennial Plantings, Fruit and Berry Crops". A. N. Voytenko reported on patterns in the formation of acarocenosis in orchards in the Ukraine and its change as a result of agrocultural measures. Two reports from N. I. Gribkova, A. V. Shestakova and A. Ye. Moiseyev were devoted to the development of an integrated system of orchard protection against pests. New information as to the effect of fine-droplet spraying with insectofungicides on useful and harmful entomofauna in apple orchards in the Lithuanian SSR was covered in information from A. I. Zimavichyus. Reports from T. I. Chebotar' and Ye. B. Gorkavenko dealt with grape resistance to phylloxera and factors that limit its development, population numbers and spread. A detailed analysis of the species composition of pests in fruit trees in the lower Povolzh'e regions, specifics of their biology and harmfulness was made by A. G. Lagunov. Presentations by M. Rilishkene contained information on the biology and risk factors of the rose moth while Ya. Zhukauskene reported on the effect of entomopathogenic organisms on this pest. I. D. Batiashvili and T. Ye. Dekanoidze reported on methods of determining the coccoidea population threshold for grapevines as an example of Imerchiyan grape scale. G. I. Dekanoidze and Z. A. Kokhreidze informed the gathering about the effect of pesticides in use to control aphids on ladybugs. A. A. Kosoglazov spoke on pests in perennial flower crops and measures to control them. One report (by I. Miselyunene and Yu. Valyukas) dealt with the effect of microbial preparations on basic garden pests in the setting of the Lithuanian SSR.

Forty four persons took part in the work of the subsection "Biological Methods of Control" notwithstanding a small number of presentations (13). It was noted in a report by G. V. Gusev on "Local and Introduced Entomophages of the Colorado Beetle" that a number of local entomophages had adapted to feeding on the eggs and larvae of young adults and, in some instances, had substantially reduced pest population. S. S. Izhevskiy discussed the status, future and means

to increase the effectiveness of efforts to introduce and acclimatize useful insects in the USSR. A report by A. T. Ushchekov was devoted to the practical use of certain species of aphid lions to control aphids on covered ground while V. P. Sem'yanov presented new data on parasites and assassin bugs of the lady bird beetle in his report. Three reports (V. I. Pilipyuk, L. F. Vecher, V. V. Bolotnikova and P. V. Supranovich) covered various aspects of the biology, ecology and methodology of using various species of the Trichogrammatidae. B. P. Adashkevich pointed out the possibility of protecting cabbage against a complex of pests by using biological agents alone. Presentations by Ts. G. Bronshteyn, O. V. Kovalev and S. S. Tyurebayev dealt with the questions of controlling weeds by using phytophages. Material from P. A. Vislov contained the results of using microbiological preparations in vineyards to control leaf roller moths.

An evaluation of the work of the Section, as a whole, should note the high scientific level of the papers presented for discussion. It is gratifying that reports were made on mathematical modeling and on study of the effect, on pests, of industrial technology for cultivating agricultural crops.

Materials from the work of the section will be published in a separate collection.

Special note should be made of the work done by the organizational section. Necessary and well-equipped room accommodations were placed at the disposal of the participants which was conducive to a successful and fruitful effort. Heartfelt thanks are also extended to our Lithuanian colleagues on behalf of all the section's participants.

[502-9003]

9003
CSO: 1840

VETERINARY MEDICINE

ON THE LEADING EDGE

Moscow VETERINARIYA in Russian No 11, 1980 pp 10-11

[Article by V. I. Khomenko, N. P. Stolyarchuk and L. D. Dorosh, Kiev Oblast]

[Text] Prevention of disease and raising healthy calves are of important economic significance in modern development of animal husbandry.

Specialized industrial type farms and also farms which deliver and receive feeder calves cannot operate efficiently without fulfilling a complex of organizational-economic, zootechnical and veterinary-sanitation measures. The operating experience of these farms is revealed by the topical exhibition "Achievements of Veterinary Science and leading experience for animal husbandry" in the Animal Husbandry Pavilion of VDNKh [Exhibition of Achievements of the National Economy] of the Ukrainian SSR.

Interesting materials and exhibits were sent to the exhibition by veterinary specialists of the Sovkhoz imeni Shchors, Brovarskiy Rayon, Kievskaya Oblast. The unflagging attention of the main veterinary physician of the sovkhoz S. A. Perekhrest and his work colleagues M. F. Sharapov and A. Ye. Tkalenko was turned toward herd reproduction and prevention of diseases of the newborn calf. A complex of measures which provide hardy well-being of animal husbandry with respect to infectious diseases has been developed and implemented on the farm.

The veterinary workers of the sovkhoz introduced a clear prophylactic dispensary system for the maternal stock. Horned cattle reproduction depends to a significant degree on the work of artificial insemination technicians. The rectocervical method of insemination has been used on the sovkhoz for more than eight years with the assistance of specialists of the central artificial insemination station. The fertility of the cattle with first insemination was increased by 12 percent. A method of inseminating cows and heifers with deep-frozen sperm has recently been developed.

According to the recommendation of the Ukrainian Scientific Research Institute of Breeding and Artificial Insemination, an artificial insemination laboratory in which all conditions have been created for observing veterinary-sanitation requirements when carrying out insemination has been equipped on the farm. Since 1977 the staff of the artificial insemination station has been additionally supplemented with two workers. Their duties include timely determination of animals in estrus, tagging them and assisting the technicians in artificial insemination of the cattle.

Veterinary specialists systematically examine cattle for pregnancy and render qualified assistance to them in determination of functional or morphological disturbances in the organism. Special attention is devoted on the sovkhoz to preparation of cattle for calving. All the necessary conditions have been created for them in the birthing barns. The cow licks the calf dry when it is born. After being dried off, the newborn calves are transferred to individual stalls where they are observed.

The calves are fed their first portion of colostrum within 45-50 minutes after birth. They are fed 3-4 times per day with normal intake of 1.5 liter of colostrum per feeding. The daily dose of colostrum is gradually increased on subsequent days. During the first 24 hours of life, weak calves are given no more than 0.5-0.6 liter of colostrum per feeding with the number of feedings being increased to 4-5. The amount of colostrum is brought up to the norm on the second or third day. The calves are given 25-30 milliliters each of ABK [Acidophilic broth culture], PABK [Para-aminobenzoic acid] or 300-400 ml of an isotonic solution of sodium chloride 30 minutes before feeding.

The requirements of veterinary sanitation are strictly adhered to in the veterinary dispensary. The water bowls are treated with boiling water after use. The stalls are cleaned and disinfected once per week with calcium hypochlorit, chloramine or caustic soda and are whitewashed, the floors and waste channels are sprinkled with powdered lime and the utensils are washed and disinfected with a two percent solution of formaldehyde or a three percent hot solution of caustic soda.

Gamma globulin is administered to the calves during the first days of their life at the rate of 0.3-0.5 grams per kilogram of body weight to stimulate formation of antibodies against pathogenic and conditionally pathogenic microflora and vitamins and antitoxic serum against paratyphoid and coli bacteriosis. Sick calves are isolated and treated. They are subsequently kept under veterinary observation.

The calves are transferred to a whole milk substitute during the post-colostrum period and they are fed hay and concentrated feed from the second week of life. Citrated blood is administered (2 ml intramuscularly per kilogram of body weight) to weak calves and they are given cooled boiled water. Salt solutions or broths of medicinal plants, fruits, berries and tea are used extensively on the farm.

Effective preventive measures, early diagnosis of diseases, rational treatment, complete feeding and good zoohygienic conditions of animal maintenance made it possible for the sovkhoz workers to achieve a high survival rate of the young calves (99.6 percent) and to receive 96 calves from 100 cows.

The veterinary workers of the farm maintain close contact with specialists of the Brovariy Station for Control of Animal Diseases, the oblast veterinary laboratory and also with the veterinary services of many specialized farms to which they send their young calves for feeding and raising.

A permanent participant of the VDNKh of the Ukrainian SSR among these farms is the Special Farm Trebukhovskiy, whose workers significantly supplement the milk herds of sovkhozes located around Kiev with noncalving cows. The operating efficiency of

the special farm is largely determined by raising full value noncalving young cows. Therefore 15-20-day old calves are subjected to clinical examination from the moment of arrival and are administered antistress preparations. They are then treated with a one percent solution of potassium soap or chlorofos in special boxes and are dried off. The young calves are then placed in a preventive-type quarantine building where they are maintained until 2-1/2 months old.

According to instructions, the calves are vaccinated against paratyphoid, Coli bacteriosis and trychophytosis with subsequent revaccination. Special attention is given to maintenance in buildings with optimum microclimate. The humidity does not exceed 70-75 percent, temperature is 15-18°C and ventilation operates reliably in sections for the animals.

The calves are kept untied in stalls of 10-20 head each from 2.5 to 6 months and in stalls of 40-50 head each from 6 to 12 months. During the summer season they are let out in lots and pastures, which are equipped with feeders, automatic waterers and sheds. The animals are sent out to cultivated pastures in groups of the same age, where they are fed green silage and concentrated feed. Noncalving young cows are transferred to the sovkhozes from which they came for raising after 4-5 months of pregnancy after a check. Feeding of the calves is organized from 1.5 to 6 months of age so that their average daily gain is 800-850 grams and so that the body mass has reached 160-165 kg by the end of the period.

Veterinary-sanitary measures in the buildings are carried out when the stock is changed with compulsory sanitary break for periodic cleaning, washing, disinfection and repair. Problems of feeding and maintenance of the animals are constantly in the field of activity of the chief veterinary physician of the special farm V. N. Trush and his assistants N. A. Semenchenko, L. N. Gutakov and I. S. Yakimenko. The raised and prepared feeds are examined by them for toxicity and carotene, calcium and phosphorus content. The blood, which is taken from 10-15 percent of heifers of each age, is carefully examined, especially in winter. The careful approach of the veterinary specialists toward prevention of diseases and recruitment of all animal breeders to this work permitted the special farm to sell more than 3,000 noncalving young cows in 1979. The monetary income was more than three million rubles.

Part of the bulls from the Sovkhoz imeni Shchors are sent to the Sovkhoz-Combine imeni 25th CPSU Congress, Obukhovskiy Rayon, Kievskaya Oblast. More than 67,000 young calves intended for fattening were sent to the farm for raising and feeding since the farm was put into operation (1975). Last year alone the sovkhoz sold to the state more than 17,000 head of young calves with body weight of more than 400 kg.

The young calves are maintained in confining boxes. The animals receive regenerated milk, combination feed and alfalfa hay during the maturation period and they receive a universal granulated combination feed during fattening. The Komsomol-youth brigade of veterinary specialists, N. F. Dulya, G. A. Korkitko and N. P. Titorenko, who are skillfully managed by chief physician I. M. Tarabar, service the complex. Due to their love of labor and persistence, the sovkhoz-combine has become one of the best in the oblast. It was a frequent participant of VDNKh of the Ukrainian SSR.

The experience of the veterinary servicing of bulls from the moment they come onto the farm until they are turned over to the meat packing combine was reflected in 1980 in two pavilions of the exhibition--"Animal husbandry" and "Horned cattle." Thus, after being transferred from the quarantine building, the calves are vaccinated against emphysematous carbuncle and anthrax and are selectively examined for leptospirosis.

The veterinary workers of the sovkhoz-combine carefully observe the "empty-occupied" principle. Thus, the sanitary break during the first fattening period comprises 5-6 days and that during the second period comprises 7 days. During this time the buildings for the animals are cleaned, washed, disinfected and repaired. The quality of disinfection is checked by the veterinary laboratory. The walls, partitions and feeders are whitewashed once every six days during the interval between sanitary breaks.

Full-value feeding, good maintenance conditions and strict observation of veterinary-sanitation rules permitted the sovkhoz workers to achieve high survival rate of the animals in 1979--99.96 percent.

All the activity of the specialists and livestock breeders of Brovarskiy Rayon, Kievskaya Oblast under conditions of specialization and interfarm cooperation is directed toward improving preventive and therapeutic work on the farms and improvement of herd reproduction. Organization of dry groups of cows and maintenance of young calves in prophylactic dispensaries deserve a special place in the work of the veterinary service.

Veterinary specialists work according to personal plans in the rayons and the oblast. This disciplines their labor, generates initiative and permits them to introduce the advances of science and leading experience into animal husbandry practice, directed toward a worthy celebration of the 26th Party Congress.

[508-6521]

6521
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FACTORS OF THE EPIZOOTIC PROCESS

Moscow VETERINARIYA in Russian No 11, 1980 pp 14-15

[Article by Ye. A. Suvorov, Kuybyshev Veterinary Scientific Research Station]

[Text] Rather complex principles of the epizootic process in tuberculosis were determined when conducting sanitation measures on farms on Kuybyshevskaya Oblast. Analysis over a period of 20 years (1959-1979) on epizootic focal areas made it possible to determine two cycles of the rise and fall of the sick rate.

Accumulation of sick cattle in isolation wards and mass movement of animals related to concentration of farms are typical for the first cycle (1959-1968). This caused an increase of the sick rate and the appearance of large infection focal areas. Agricultural organizations adopted measures to turn over sick and tuberculin-positive animals for slaughter and to carry out a complex of sanitation measures which made it possible to achieve a uniform reduction of the sick rate of animals.

The second cycle (1969-1970) occurred when all animals responding positively to the tuberculin test were turned over for slaughter. Nevertheless the sick rate increased over a period of five years from 0.7 to 2.6 percent, but was reduced to 0.9 percent by the end of the decade.

Trends toward an increase of sick rate began to appear again in 1980. We feel that this was determined by such factors as the presence of animals who were latent carriers of infection and a higher survival rate of Mycobacteria in the environment than was assumed. It was determined as a result of laboratory and epizootological investigations of the causes of repeated appearance of disease at previously sanitized points that these two factors are of main significance.

It is noted that the rise of sick rate during the second cycle occurs at a time when animals of 6 to 8 years of age began to predominate in the herd. A unique course of the disease was established by observations; the number of positive animals was reduced usually after 3-4 examinations. Comparison of the data of laboratory analvses and epizootological observations permit one to conclude that a latent carrier state of a pathogenic agent without manifestation of a reaction to administration of tuberculin is rather widespread in focal areas of prolonged trouble and may determine repeated manifestation of the disease. The basis for this is probably L-transformation of pathogenic agents both in the organism and in the environment.

A favorable situation has now been established in Kuybyshevskaya Oblast for sanitization of remaining trouble points. We place high hopes in this regard on raising healthy noncalving young cows on specialized farms.

Considering the problem of the prospects for sanitation, one should dwell on the conditionally favorable points with respect to tuberculosis. The main cause for the manifestation of tuberculin reactions is circulation of nonpathogenic types of a wide group of Mycobacteria among the animals and in nature. The zones of their distribution in the oblast are mainly river floodplains and forested terrain. The nonpathogenic nature and allergenic nature have been proven rather objectively, but their capability of circulation through the animal-environment-animal cycle has been established, which makes the process infinite. There are conditionally favorable farms where animals reacting to administration of tuberculin appear every year.

[508-6521]

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PROBLEMS OF SCIENTIFIC RESEARCH ON BRUCELLOSIS

Moscow VETERINARIYA in Russian No 11, 1980 pp 15-16

[Article by Professor P. S. Ulasevich]

[Text] In conducting a planned study of brucellosis of animals, veterinary and medical specialists of our country have conducted thousands of experiments both under laboratory and under production conditions and have determined the main areas of the given problem. This made it possible to work out a system of preventive and sanitation measures, with use of which brucellosis has been eliminated in many rayons, oblasts and republics.

At the same time brucellosis of horned cattle is still widespread in some zones and sanitation of affected farms is prolonged. In this regard the search for rational, highly effective systems of prevention and sanitization of the defective farms, mainly with respect to distant-pasture animal husbandry, is of special significance. This in turn requires more extensive scientific investigations on a number of problem areas.

The pathogenesis and immunogenesis of brucellosis were studied in time, but modern methods of research permit us to gain deeper knowledge about these processes.

The search for new rapid methods of determining the infection should also be continued. The antibody neutralization reaction, which should be tested, will undoubtedly play a positive role in improvement of bacteriological diagnosis. Problems of allergic diagnosis of brucellosis among horned cattle and infectious epididymitis among rams have still not been completely resolved. The heterogenic properties of the brucellosis antigen to antibodies, developed by animals to other antigens, should be studied and the reaction to rivanol, to which a number of foreign investigators give specific significance, should also be studied. However, in proposing that new methods of diagnosis be introduced, one should bear in mind that an increase of the number of compulsory reactions is unjustified in practice.

In planning work on specific prevention of brucellosis for the near term, one should take into account that the main thing is to continue the search for new antibrucellosis vaccines for horned cattle, sheep and reindeer with higher and longer protective capability and also for vaccines against infectious epididymitis among rams. The search for chemical vaccines merits attention.

The next very important problem is deeper study of the regional epizootology of brucellosis with regard to the zonal characteristics of animal husbandry and its

specialization. The effectiveness of preventive, diagnostic and sanitization measures should be determined in order to improve them in good time.

Creation of large livestock complexes and farms for raising replacement heifers and intensification of breeding work obligate scientists and specialists to devote greater attention to development of specific measures for prevention and elimination of brucellosis with respect to the given category of farms.

It has again become necessary to return to the problem of the so-called natural focal area of brucellosis and of the significance of wild animals as a source of the pathogenic agent. This is related to the fact that the proponents of that theory incorrectly orient practical specialists, assuming that the struggle against brucellosis cannot be waged successfully without destruction of the pathogenic agent among wild animals. However, there are data which indicate that there is no natural focal area of brucellosis as such, but total elimination of infection even on large areas is possible without additional measures to control the disease among representatives of wild fauna. The problem of studying brucellosis among elk, saiga, reindeer and wild boar and development of methods of predicting the epizootic situation with respect to brucellosis in different zones of the country become very special. There is no doubt that investigations directed toward improving the methods of manufacture and testing of biological preparations used in brucellosis (antigens, vaccines and so on) are necessary.

This is a brief list of the problems of brucellosis which should be studied in the next few years. Moreover, scientists should continuously render scientific-methodological and practical assistance to veterinary specialists of farms in prevention and eradication of brucellosis among animals and should intensify sanitation-educational work.

Consequently, scientists are faced with important and responsible tasks. What is required to accomplish them? First of all, work should be carried out more purposefully and scientific developments should be completed and they should be introduced as quickly as possible into practice.

[508-6521]

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HEALTHY ANIMALS FOR FARMS

Moscow VETERINARIYA in Russian No 11, 1980 pp 16-17

[Article by V. I. Piontkovskiy, V. S. Shablov and D. P. Bakhtin, Kustanay Veterinary Scientific Research Station]

[Text] Among the many problems faced by livestock breeders of Kustanayskaya Oblast and directed toward further development of the sector, an obligatory one is eradication of chronic infectious diseases, primarily tuberculosis and brucellosis.

Based on careful analysis of the epizootic situation with respect to tuberculosis and brucellosis of horned cattle, veterinary specialists of the oblast have worked out promising and operational (annual) complex plans for prevention and eradication of these infections, differentiated for each troublesome farm. Besides veterinary measures, construction of veterinary-sanitation objects has been determined and deadlines and the sequence of replacing troublesome livestock with healthy livestock have been designated in the plans confirmed by the Oblast Council of Working Peoples Deputies. Special attention has been devoted to creation of farmsteads within the large farm for isolated raising of noncalving young cows. This work has been carried out on farms of the oblast since 1972 according to the following approximate technique.

A large farmstead is organized on a section of a sovkhoz sanitized of tuberculosis and brucellosis. Along with construction of new buildings for housing of animals, existing buildings are being reconstructed with regard to the requirements for farmsteads for raising noncalving young cows.

The area of the farmstead is enclosed, it is planted with trees and is divided into production and economic zones. The veterinary-sanitation office, livestock buildings, feeding and loafing areas are located in the production zone and there are control cattle barns for checking primapara heifers for productivity and for preparing them for commercial techniques.

Along with introduction of a continuous shop milk production system on farms favorable with respect to tuberculosis and brucellosis of horned cattle, the milking barn is at the same time a control-selection cow barn where subequent use of primapara heifers is determined. The economic zone contains a feed lot, hay barn, silage and haylage towers or trenches, boiler room and so on.

The heifers are delivered on a specially equipped truck 8-10 days after birth to the calf-receiving area of the farmstead for raising noncalving heifers, where they are weighed and subjected to sanitary treatments. The female calves are kept in group stalls (5-8 head each) of the quarantine building for one month.

During the quarantine they are examined extensively and immunized according to the epizootic situation. The animals are moved, formed into herds and regrouped only with authorization of the chief veterinarian of the farm. Stationary units are equipped for disinfecting the stalls in calf barns.

The female calves are maintained from six months of age in calf barns with deep bedding with free access to loafing yards and feeding areas.

When the animals reach a weight of 300-320 kg (from the 17th to 18th month of age), they are formed into herds and inseminated. The heifers are checked within two or three months for pregnancy. Noncalving heifers with established pregnancy are formed into separate herds.

The noncalving heifers are transferred to the birthing section or calving barn 10-15 days before the anticipated calving. The primapara heifers are transferred to the control yard two weeks after calving. The rations for them are reviewed 2-3 times per month. The primapara heifers which meet established requirements are transferred for replacement of maternal stock unfavorable with respect to tuberculosis and brucellosis, while those rejected for various reasons are sent for commercial cross-breeding with bulls of meat breeds. Movement of the herd is accomplished in this manner. And now more detail about veterinary measures.

One-month-old heifers under quarantine are examined by the allergic method for tuberculosis. Calves responding negatively are transferred to the group calf barn. The animals are subsequently examined every 45-60 days until negative results of two tuberculin tests are obtained. The groups are set up for six-month checking with examinations every three months. If the results are negative, the group of calves is given a favorable rating with respect to tuberculosis. These herds of horned cattle are subsequently checked once every quarter and must be checked prior to insemination.

The farm veterinarians use isoniazid and BCG antituberculin vaccine to prevent infection of calves during the first days of life.

Precautionary measures with respect to tuberculosis, we feel, deserve attention. Female calves 8-10 days old from conditionally healthy cows are also transferred to a specialized farmstead and the mother cows are examined for brucellosis during their quarantine period. If the mother cow of a female calf sent to the specialized farmstead reacts to the brucellosis test, the calf is removed from the group and is sent to the feed lot.

In spring a committee in the section designated for sanitization determines the volume of work for preparation of healthy cattle for acceptance. Brigades and mechanized sections are created on the farm for purification of the buildings and area of the farm, conducting sanitation measures and repair and reconstruction of buildings. The adult cattle and calves are removed to camps during this period or are removed to equipped areas beyond the farmsteads.

The appropriate veterinary treatment of the animals and diagnostic examinations for tuberculosis and brucellosis are carried out during the pasturage period. Herds of the same age are formed from noncalving and primapara heifers and also from mother groups raised on specialized farmsteads for complete supplementation of sanitized farmsteads and sections. It is better to arrange primapara heifers in individual herds.

Only healthy animals are introduced into undamaged and repaired buildings of farmsteads in the fall during the planned periods. Unfavorable stock of other sections of the farm are replaced during subsequent years in the same sequence.

Chemical prophylaxis with isoniazid is used in the total complex of sanitization measures when raising female calves on a number of sovkhozes of the oblast. A total of 13 large farms, on 12 of which bruselloois was also eliminated simultaneously, was sanitized by using chemical prophylaxis against tuberculosis of horned cattle. To do this, step-by-step replacement of diseased stock with healthy female calves was carried out. Tuberculosis reinfection was not observed.

We have been conducting production testing of BCG antituberculin vaccine since 1977 on farms which have been troublesome for a long time with respect to tuberculosis of horned cattle. It was established that this vaccine in the total complex of measures protects the animals against natural infection with the pathogenic agent of tuberculosis and also reduces the number of severely occurring forms of tuberculosis. Examination of the carcasses and internal organs of animals slaughtered for diagnostic purposes did not reveal a single case of generalized tuberculosis. Only local forms were found in the form of incomplete tuberculosis complex without sharp enlargement of the lymph nodes and a tendency toward progression of the process.

A vaccine from strain 82 was used in the total complex of measures to sanitize horned cattle farmsteads of brucellosis. Since the beginning of using it (1974), 178,000 cows have been raised and 61 locations have been sanitized, whereas only eight were sanitized during the preceding six years (1968-1973) using a vaccine of strain 19, and, 45 unfavorable locations were again determined.

As a result of organizing specialized farmsteads for directed raising of replacement calves, the possibility has been created in the oblast for sanitization of farms of tuberculosis and brucellosis of horned cattle by step-by-step replacement of unfavorable stock with healthy female calves on the farmstead, section and sovkhoz scale. Moreover, the experience of sanitization of farms troublesome with respect to tuberculosis in combination with chemical prevention and BCG antituberculosis vaccine showed that tuberculosis can be eradicated even on farms with significant distribution of the disease.

[508-6521]

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DISINFECTION OF MANURE IN CASES OF BRUCELLOSIS

Moscow VETERINARIYA in Russian No 11, 1980 pp 23-24

[Article by Ch. Kerimov and K. Atayev, Turkmen Scientific Research Institute of Animal Husbandry and Veterinary Science]

[Text] According to data of a number of authors (M. Ye. Avvakumov, 1935; A. A. Polyakov, 1950 and others), the pathogenic agent of brucellosis in manure can retain viability and pathogenic properties up to 80 days, depending on conditions. A. A. Polyakov, V. G. Zharov, A. A. Samolovov and N. P. Lyubakov (1974) studied the possibility of using the biothermal method of disinfecting manure in cases of brucellosis in Tyumenskaya and Moskovskaya Oblasts. They established that the Brucella survived up to 25 days. I. D. Grishayev (1976) reported that the pathogenic agent of brucellosis in liquid manure died within 108 days in summer and within 174 days during the cold season of the year under conditions of the mid-section of our country.

We decided to study the retention of Brucella in manure and biothermal disinfection of it in Turkmeniya by seasons of the year and with different methods of storage. It is known that the biothermal method is based on creation of high temperature in the manure pile due to the action of thermogenic microbes. The method is simple, inexpensive and convenient for application. Based on this, we set ourselves two tasks: to clarify the biothermal process in different ordinary manure piles and to establish the periods of death of the Brucella during all seasons of the year and to determine the possibility of using the biothermal method of disinfection of manure seeded with Brucella during different seasons of the year.

A total of eight experiments was carried out to solve the posed problems. A total of 100-120 test objects, which were piles of cow manure (5 grams) seeded with the pathogenic agent of brucellosis (vaccine strains 19 and 82) with density of infestation of 500 million microbe bodies per 1 gram of manure, was placed in each pile. The test specimens were placed in capron bags which were inserted into the manure pile at different depths (from 10 cm to 1.5 meter). The viability of the microbes was subsequently established by the method generally accepted in bacteriological practice. The death of the Brucella was also monitored by coliform bacteria (BGKP) contained in the fecal specimens.

In spring the solid fraction of cow manure was deposited on a plowed area 4 meters long, 3 meters wide and 1.8 meters high. The moisture content of the manure was 75 percent and pH was 7.9. During this season of the year, the ambient air temperature

was between 8 and 38°C and the relative humidity was 11 to 81 percent. During the observations, the temperature in the pile fluctuated from 28 to 55°C. The pathogenic agent of the brucellosis and the coliform bacteria died within 50-60 days.

In summer the manure was placed in a pile 3.5 meters long, 2.5 meters wide and 2 meters high into which the test specimens were placed. The moisture content of the manure was equal to 30 percent in the pile and pH was 7.4-8.1. The temperature of the manure in the pile was 45-50°C and it had reached 70-72°C at a depth of 50 cm by the third day. During this period the ambient air temnerature fluctuated from 20 to 42°C and relative humidity fluctuated from 10 to 52 percent. It was noted that the Brucella and coliform bacteria died within 3 and 15 days, respectively, in summer when the manure was stored in a pile.

The survivability of coliform bacteria during storage of manure in a pit 3 meters long, 2.5 meters wide and 1.5 meters high was studied in the fall. The moisture content was 85 percent and pH was 8.9-7.8. The temperature inside the pile began to rise by the fifth day. It was 37°C at a depth of 10 cm, 56°C at 30-35 cm and 48°C at 1 meter and remained unchanged until the 25th day. During this period the ambient air temperature fluctuated from 2 to 32°C and relative humidity fluctuated from 40 to 84 percent. Under these manure storage conditions the coliform bacteria died within 30-45 days in the deep layers (1.5 meters) and by the 80th day in the surface layer.

In winter the moisture content was 85 percent and pH was 8.8 in a manure pile 6 meters long, 4 meters wide and 2.5 meters high. The ambient air temperature fluctuated from -14.1°C to +20.6°C and relative humidity was from 45 to 98 percent. The temperature at different points of the pile and at different times was within the range of 15-40°C. The coliform bacteria on the surface of the pile survived for 91 days and those at a depth of 2 meters survived for 120 days. There were no differences in the periods of survival of the coliform bacteria in samples taken at different depths of the pile.

Having refined the biothermal process in different manure piles and having established the periods of depth of Brucella during all seasons of the year during ordinary conditions, we tested the method of biothermal disinfection of manure from brucellosis-infected animals, recommended by instructions. The manure was placed in a trench 5 meters long, 4 meters wide and 30 cm deep, in the middle of which was dug out another trench 50 cm deep and wide. The trench was coated with concrete. Before the manure was piled up, the channel was covered with wooden boards and its bottom was covered with alhagi together with straw up to 40 cm deep to intensify aeration of the manure. The manure was piled loosely up to 2 meters high, with the lateral surfaces sloped. Test objects were placed in it at different points and at different depths.

In spring the temperature in the manure pile reached 70°C by the 12th day and remained at a level of 62-65°C up to 35 days. The moisture content fluctuated from 61 to 74 percent and pH was 7.9. The pH was equal to 7.7 at the end of the experiment (on the 30th day). The Brucella died in the pile between 12-20 days and the coliform bacteria died within 30 days.

In summer the moisture content of the pile was 33 percent and pH was 8.6. The manure dried out rapidly due to the high ambient air temperature (42-47°C) and the low relative humidity (5-10 percent). However, the thermal process proceeded rapidly in the pile. The temperature reached 72°C in the manure pile by the second day and reached 62-60°C by the 10th day. Under these conditions the Brucella died on the second day and the coliform bacteria survived up to the fifth day.

In fall the moisture content of the manure was in the range of 64-70 percent and pH was 8.8. The temperature inside the pile rose to 72-76°C. The Brucella in the surface layer died within 10 days and the coliform bacteria died within 30 days. The Brucella and coliform bacteria died within three days at a depth up to 1.5 meters in the manure pile.

In winter the moisture content of the manure comprised 75 percent and pH was 7.6. The thermal process in the pile proceeded slowly. The temperature inside it fluctuated from 1 to 15°C over a period of three months. The Brucella died within 45-50 days and the coliform bacteria died within 130 days.

Conclusions

1. Brucella and coliform bacteria survive up to 50-60 days in spring, 3-15 days in summer, 30-80 days in autumn and up to 90-120 days in winter in Turkmeniya with biothermal disinfection of manure and with ordinary methods of storing it in piles.

2. Brucella die within 20 days in spring, 2 days in summer, 1 day in autumn and 45-50 days in winter and coliform bacteria die within 30, 5, 30 and 130 days (according to the season of the year) with biothermal disinfection of manure when using alhagi instead of straw.

3. The thermal process proceeds slowly at a high moisture content (75-98 percent) of the manure and it proceeds more intensively at low moisture content (33-74 percent).

4. The quality of disinfection of the manure in cases of brucellosis can be monitored by coliform bacteria.

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SODIUM PYROPHOSPHATE TO EXAMINE THE SOIL FOR ANTHRAX

Moscow VETERINARIYA in Russian No 11, 1980 p 25

[Article by A. I. Zaviryukha and A. N. Kharchuk, Ukrainian IIVI]

[Text] Methods of examining the soil for anthrax, which are used by veterinary and medical laboratories, provide for the use of sterile water as a liquid medium to prepare the soil suspension.

J. Ojiet and J. Pochon (1958) and D. G. Zvyagintsev used sodium pyrophosphate solutions to prepare the working suspension in bacteriological examination of soil and achieved a higher yield of microbial colonies on beef-extract agar than from the suspension prepared in water without this substance.

Experiments carried out in the laboratory on the use of sterile sodium pyrophosphate solutions in a 0.25-, 0.5-, 1- and 2-percent concentration as a liquid medium for preparation of the soil suspension during bacteriological examination of it showed that 2-5 times more microbial colonies grows on MPA [beef-extract agar] (depending on the type of soil and the percentage concentration of sodium pyrophosphate) than from a suspension of the same soil prepared in water. The most significant yield of microbial colonies was noted in soils from a suspension prepared on a 0.5 percent sodium pyrophosphate solution.

The results of investigations to study bacillar microflora of soil in locations where anthrax-infected carcasses were buried confirmed these data. The number of incubating colonies of the pathogenic agent of anthrax increased along with the increase of the yield of the total number of microbial bodies.

This provided us with the basis to check by committee the effectiveness of using sodium pyrophosphate solutions when examining the soil for anthrax. Various types of soils were taken: ordinary medium-humus chernozem, podzolic chernozem and soddy-medium podzolic sandy loam soil. The specimens of chernozem soil were used in nonsterile form and after sterilization in an autoclave (1.5 atm for 2 hours). The sandy loam soil was not subjected to autoclaving.

A total of 100, 1,000 and 50,000 spores each of Bacillus anthracis (STI vaccine) per 10 grams of soil were introduced into some specimens and a mixture of Bacillus anthracis spores (STI vaccine) and Bacillus cereus of 50,000 spores each from each culture were introduced into other samples. The control was nonsterile soil

without the addition of spores of the indicated microbes. Bacteriological examination was carried out by the generally accepted method.

The suspension was prepared in water and 0.5 percent aqueous solution of pyrophosphate. The results were counted within 20 hours of incubation in a thermostat at 37°C. Identification of the incubated colonies was made in sowings from soil samples which were contaminated with a mixture of Bacillus anthracis and Bacillus cereus spores, using generally accepted tests and the disc precipitation reaction developed in the laboratory of the institute.

It was noted as a result of counting the incubated colonies (two incubations each from each sample) that the use of 0.5 percent aqueous solution of sodium pyrophosphate as a dispersion medium contributes to a significant increase of the number of incubating colonies, including anthrax-similar colonies, in all samples of the types of soils used.

We were not always able to isolate the pathogenic agent if distilled water was used as the suspension medium when examining soil samples (sandy loam or chernozem) for anthrax taken directly from the burial locations of carcasses. The colonies of the pathogenic agent of anthrax grew in most cases only after the water was replaced with a 0.5 percent solution of sodium pyrophosphate in soils on MPA.

The high effectiveness of isolating the pathogenic agent of anthrax in soil by using a 0.5 percent aqueous solution of sodium pyrophosphate was also confirmed in an interagency commission experiment: two colonies grew from the same chernozem soil samples, first disinfected and then contaminated with a mixture of Bacillus anthracis and Bacillus cereus prepared in water, while 230 colonies grew from a suspension in a 0.5 percent solution of sodium pyrophosphate.

Identification of anthrax-like colonies showed that four anthrax colonies grew from soil samples suspended in water, while 14 colonies grew from samples suspended in a 0.5 percent solution of sodium pyrophosphate.

Conclusions

1. A 0.5 percent aqueous solution of sodium pyrophosphate was a good dispersion medium for preparation of a soil suspension to examine it for anthrax.

2. Ten times more colonies of the pathogenic agent of anthrax grow in seedings on MPA from a suspension of sandy loam or chernozem soil prepared in a 0.5 percent solution of sodium pyrophosphate than from a suspension of the same soil prepared in water.

3. The use of sodium pyrophosphate when examining soil for anthrax increases the effectiveness and reliability of isolating the pathogenic agent of this disease, which contributes to more objective sanitation analysis of the examined soil area.

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ALLERGY IN VIRAL INFECTION OF ANIMALS

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[Article by R. G. Gosmanov, Kazan Veterinary Institute]

[Text] Allergy in infectious processes caused by viruses is manifested by very complex and still insufficiently studied immunological reactions. Being exoallergens, viruses also have a marked capability of forming indoallergens in the organism (Ye. S. Mutina et al, 1978).

A slow type allergy usually occurs when viruses affect a macroorganism, but allergic reactions of the immediate type also occur in some cases. The latter are caused more by tissue proteins in which the viruses reproduced.

The allergenic properties of viruses have been studied by using the skin test and a number of laboratory methods: blasttransformation of the lymphocytes, the neutrophil damage index (PPN), the cytotoxic action of lymphocytes in the presence of a specific antigen on target cells of different origin and the leucocyte migration inhibition reaction. The test for suppression of virus reproduction in the macrophages of immune animals can be used for this purpose and a relationship has also been established between the development of a slow type allergy and the resistance of sensitized macrophages (S. P. Karpov, 1975).

The leading role in allergic reactions of the slow type belongs to sensitized lymphocytes and it develops earlier than serum antibodies are produced. This phenomenon is most widely explained at present as reactions to counter the allergen with an antibody in the macroorganism.

It has become accepted to distinguish three stages in development of the allergic reaction: immunological, corresponding to the process of sensitization of the organism, its allergic adjustment due to formation of cytophilic antibodies in the cellular structures, pathochemical in which metabolic processes in the cells are disturbed as a result of joining of the antibodies to the newly arriving allergen, partial destruction of them and release of allergy mediators which lead to an increase of capillary permeability and the occurrence of inflammatory edema and pathophysiological, corresponding to the functional disorders of the organism which are inherent to allergic reaction with its clinical and pathomorphological manifestations (A. D. Ado, 1978).

Data have now been accumulated in the literature on allergy in viral infections of animals. Investigators used the presence of an allergic component in smallpox to diagnose the disease. M. G. Danilevich (1960) found an allergic reaction at the point of inoculation during intracutaneous administration of sensitized smallpox vaccine to guinea pigs with the contents of a pustule separated by a physiologic solution. He established that the allergy is manifested in three to five days in experiments on rabbits infected with the smallpox vaccine virus.

Positive results were achieved in diagnosis of hog cholera by the allergic method (Karlovich, 1965; R. G. Gosmanov and R. Kh. Yusupov, 1970, and others). We tested the possibility of using the allergic test to determine diseased animals in experimental and spontaneous hog cholera. A total of 1,368 hogs were used in the experiments. The allergen was prepared by Sarnovich's method (1934) and was administered intracutaneously on the outer surface of the ear. The local allergic reaction was characterized by the appearance of a violet swelling measuring up to 2.5 cm within 24 hours, which disappeared within 72-96 hours. The allergic test made it possible to identify 55-62 percent of diseased animals in experimental and spontaneous hog cholera.

It should be noted that immunization of hogs with a live virus-vaccine creates an interlayer of animals (31-35 percent) in the herd which react to the allergen. Reactions to administration of the allergen were not observed in unvaccinated and clinically healthy hogs.

Terni (1907) first reported an allergy in hoof and mouth disease. According to data of Beck and Zimmerman (1954), K. A. Pozdeyev (1962), R. G. Gosmanov (1970), B. V. Gorskiy (1973) and others, the allergic phenomenon plays an important role in the pathogenesis of hoof and mouth disease. We (R. G. Gosmanov (1977) prepared a hoof and mouth disease allergen from the virus, purified by the differential ultracentrifuging method and inactivated by ultraviolet radiation. The preparation was avirulent and harmless to animals. Preparations prepared from an uninfected cultural suspension of pig kidney cells by a similar method were used as the control.

The hoof and mouth disease allergen was tested on 450 guinea pigs and on 380 head of horned cattle. A positive local skin allergic reaction developed in 90-95 percent of the cases within 24-72 hours after intracutaneous administration of the hoof and mouth disease allergen to diseased animals and to reinfected horned cattle (up to five months) and guinea pigs (up to six months). There was no skin reaction to administration of the control preparation.

Changes typical for local allergic reactions were noted upon histological examination of skin sections after administration of the allergen. The existence of a specific correlation between the allergy and content of specific antibodies was established.

Clincially healthy animals, those vaccinated once against hoof and mouth disease and anthrax, animals sick with tuberculosis, brucellosis, influenza and micoplasmosis did not respond to administration of the hoof and mouth disease allergen.

There are data (Shkoda, 1965; Kharlambiyev and Iotov, 1967; Iotov, 1969 and 1973 and others) on the use of the skin allergic reaction as a diagnostic test in Aujeszky's disease. The allergen was prepared from a virus of Aujeszky's disease, by

using which hogs from herds with different epizootic situation with respect to Aujeszky's disease were examined. A positive allergic reaction developed within 24-48 hours after intracutaneous administration of the allergen. It was marked by formation of transient edema of a paste-like consistency measuring from 2-4 cm. Among clearly reinfected hogs, 71.2 percent responded positively. The allergic reaction appeared during later stages of the infectious process and was retained for a long time after enzooty was stopped. This method can be used to determine stationary focal areas of infection.

Smith and Mengeling (1976) also showed that intracutaneous administration of a heat-inactivated antigen of the virus of Aujeszky's disease is easy to perform and a simple, quick and specific test to isolate animals chronically infected or reinfected with Aujeszky's disease.

According to data of Sherba et al (1978), an allergic skin reaction to antigens prepared from the virus of Aujeszky's disease was observed in most reinfected hogs.

The allergen which we prepared from purified, concentrated and inactivated culture virus of Aujeszky's disease (R. G. Gosmanov, 1978) was active in the complement fixation reaction, avirulent and harmless to rabbits and piglets. Native and lyophillically incubated, it retained its activity during storage (+4° and -20°C) for nine months (the period of observation).

The allergen was tested on 179 piglets from 2 to 9 months old. Among this number, 49 head were infected with the virulent strain of the virus of Aujeszky's disease, 51 were immunized with a vaccine from strain BUK-628, 11 were immunized with a vaccine from strain VGNKI, 13 were immunized simultaneously against Aujeszky's disease, hoof and mouth disease and hog cholera, 18 were immunized against hog cholera, 6 were infected experimentally with hog cholera and 27 were healthy animals.

A specific skin allergic reaction occurred in 58-87 percent of the cases with intracutaneous administration of the allergen in healthy piglets and those reinfected with Aujeszky's disease (up to four months). These results were correlated with the result of cellular reactions in vitro and with the content of virus-neutralizing antibodies in the blood serum.

The virus was isolated in animals responding positively to the allergen up to 24 days after infection and up to 118 days (the period of observation) from the pathological material. The reinfected animals reacting positively to the allergen were virus-carriers and virus-excretors and intact piglets coming into contact with them became ill with Aujeszky's disease.

Piglets vaccinated against Aujeszky's disease reacted to the allergen for three months after immunization with content of virus-neutralizing antibodies in the blood serum in a titer of 4 $\log_2$ and higher. The reaction was not manifested after six months.

Diseased animals reinfected with Aujeszky's disease and animals vaccinated against it did not react to intracutaneous administration of a control preparation of uninfected culture suspension of PPES cells. Piglets immunized against hog cholera and those ill with cholera also did not react to administration of the allergen.

The results of these experiments showed that the allergen in Aujeszky's disease has specific activity and can be used for allergic diagnosis of virus-carriers in Aujeszky's disease of swine.

Thus, study of allergy in virus infections of animals opens up a promising method for using this phenomenon as a diagnostic method.

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ISOLATING THE L-FORM OF LISTERIA FROM THE ORGANISM

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[Article by T. Ya. Zelentsova and I. A. Bakulov, All-Union Scientific Research Institute of Veterinary Virusology and Microbiology]

[Text] Sources of the pathogenic agent of infection in listeriosis are sick animals and listeria-carriers, which release the pathogenic agent into the environment with secretions from the eyes, nasal membranes, feces, urine and milk. Listeria are released especially abundantly with secretions from the sexual organs in animals which have aborted on the basis of listeriosis (M. M. Kharlambekov, 1955; Yu. A. Malakhov, 1960; Borkenhagen, 1964; P. P. Melikhov et al, 1971; Berger and Pietsch, 1975).

We studied the possible methods of release of the L-form of listeria from the organism of experimentally infected lambs and the role of these animals in the epizootology of the disease with regard to the suggested role of the L-form of listeria in the pathogenesis of listeriosis (Lourie et al, 1967; I. A. Bakulov et al, 1973). The highly sensitive method of radioactive tracers was used in the investigation.

Two-month-old lambs of the Prekos breed, weighing 15-20 kg, which were infected with a culture of the L-form of listeria of strain 1472 tagged with radioisotope C^{14} in a glycine compound, were used as the laboratory model. The culture was administered intravenously at a rate of 3 ml in a dosage of 420 KOYe (colony-forming units) with activity of 15.096 million pulses per minute. The animals were observed for 92 days. Urine, feces and nasal secretion samples were taken after six months of infection and during the first seven days daily and then at different time intervals throughout the observation period.

The urine samples were prepared in the following manner for examination: the daily amount of it was taken for examination during the first seven days after infection. The urine was evaporated in a flask to a precipitate, which was then dissolved in 4 ml of concentrated formic acid. The targets for radiometry were prepared from this solution. During subsequent periods the urine was collected in test tubes, it was placed in the target (0.05 ml) and was dried at room temperature.

Feces was also collected during the first seven days for examination in the daily amount, from which an average sample (100 grams) was taken, it was dried in a drying cabinet to a constant weight, it was carefully pulverized in a marble mortar

and batches of 100 mg each were made. The batches were placed into test tubes with 4 ml of concentrated formic acid. The targets were prepared after hydrolysis for two days at 58°C. The feces samples were subsequently collected into test tubes, weighed in batches of 100 mg each, hydrolyzed in concentrated formic acid and targets were prepared from the hydrolyzate.

The nasal secretions were collected from both nostrils by using a single cotton tampon (the weight of the cotton was 5 mg). This tampon was then hydrolyzed in 4 ml of formic acid and the targets were prepared from the hydrolyzate. Radiometry was carried out on the Mark-2 installation.

The urine, feces and nasal discharge were examined bacteriologically to isolate listeria in bacterial or in L-form. Inoculations were made for this on an L-medium with and without penicillin and also on an elective medium with potassium tellurite. Inoculations from the brain and blood of the animals were made during the first four days for this same purpose.

The blood sera of the lambs were examined during the same periods in RA [Agglutination reaction] and RSK [Complement-fixation reaction] with antigens from the bacterial and L-forms. The number of erythrocytes and leucocytes and the leucocytic formula of the blood were determined during these same periods by generally accepted methods.

Two lambs were killed on the 32nd day after infection and three were killed on the 92nd day. The parenchymatous organs, bone marrow and spinal cord and sections of the brain were examined radiometrically. The samples were prepared by the hydrolysis method and were subjected to radiometry in ZhS-107 scintillation fluid. The presence of tagged L-forms of listeria in the animal organism and their localization were judged by the radiometric indices. Moreover, the same organs and tissues were examined bacteriologically for isolation of the L-form of listeria.

Urine, feces and nasal discharge samples had no radioactivity throughout the entire observation period (92 days). Radiometry of the tissues showed that the L-forms of listeria are capable of persisting in the organism of infected lambs for a long time. They were detected radiometrically in the spleen, lungs, kidneys, adrenal glands, bone marrow, thoracic part of the spinal cord, cerebellum, horn of Ammon and in the medulla oblongata on the 32nd day after infection.

The specific radioactivity of the parenchymatous organs was low (279-599 ppm) and that of the adrenal glands, bone marrow and thoracic section of the spinal cord was somewhat higher (839, 1,159 and 1,599 ppm, respectively). The highest radioactivity among the sections of the brain was noted in the cerebellum (2,038 ppm), less in the horn of Ammon (1,319 ppm) and the medulla oblongata (1,199 ppm).

The radio tag was absent in most of the investigated organs by the 92nd day and was identified only in the bone marrow, thoracic section of the spinal cord and the cerebellum. The specific radioactivity of these organs comprised 1,011, 772 and 559 ppm, respectively.

It should be noted that the radio tag was retained more stably in the bone marrow than in the other organs. The amount of it was reduced by half in the thoracic part of the spinal cord, by one-third in the cerebellum and it was not isolated in the horn of Ammon, the medulla oblongata and the parenchymatous organs.

Thus, the absence of radioactivity in the urine, feces and nasal discharge samples permits one to assume that L-forms of listeria are not released from the organism of lambs to the environment, but the presence of it in the bone marrow and spinal cord and cerebellum of lambs even by the 92nd day after infection indicates prolonged persistence of them in the organism of animals.

This is indirectly indicated by the indices of serological and clinical examinations of the blood. RSK yielded negative results in all cases, but the presence of agglutinating antibodies was established in RA during the period from the 14th through the 46th day after infection. RA with bacterial antigen revealed the presence of them in titers of 1:10-1:20 and RA with the antigen of the L-form revealed them in titers of 1:10-1:20, with a maximum of 1:40. They were detected up to the 46th day in these titers. The RA was subsequently negative when both the bacterial antigen and that from the L-form were used.

A decrease in the number of erythrocytes (8.7 $\pm$ 3.6-5.6 $\pm$ 1.9 million) and leucocytes (8,399,800 $\pm$ 14,300-5,079,900 $\pm$ 36,100) was established by the 39th-46th day in infected lambs by hematological examination. No changes of the relative number of both neutrophils (41.1 $\pm$ 3.9 percent) and of lymphocytes (49.4 $\pm$ 3.8 percent) were established when determining the leucocytic formula.

A considerable number of cells with pycnomorphic and fragmented neuclei and with vacuoles in the cytoplasm of neutrophils was encountered among neutrophils and lymphocytes. During the entire examination periods, basophils, eosinophils and monocytes were detected very rarely. During the later periods, the hematological indicators were within the range of the physiological norm.

The increase of the antibody titers and variation of the hematological indices in infected animals indicate the development of a latent process caused by the L-form of listeria.

To determine the epizootological role of animals infected with L-forms, five healthy uninfected lambs were brought into contact with them 11 days after infection, which were observed for 82 days with daily (morning and evening) thermometry. The blood serum was examined within seven days in RA and RSK, clinical and bacteriological examinations of the blood were made and the bone marrow was also examined bacteriologically in vivo. After the lambs were slaughtered (after 33 and 82 days of joint contact with the infected animals), their organs and tissues were subjected to radiometric and bacteriological examinations.

No signs of disease were noted in the animals during the entire observation period (82 days). The radio tags were absent in all the examined organs and tissues upon radiometric examinations. Serological examinations also yielded negative results. The hematological indices were within the range of the physiological norm.

Neither listeria nor their L-forms were isolated in a single case upon bacteriological inoculations from the blood and bone marrow of lambs while living and from all the parenchymatous organs and sections of the brain after slaughter on a special medium to isolate the L-forms of listeria and on an elective medium with potassium tellurite.

The results of the investigations showed that the L-forms of listeria are not released from the organism of infected lambs. This permits one to assume that

direct transfer of L-forms from infected to healthy animals does not occur. The bacterial form of listeria is transferred from one animal to another, but the appearance of L-forms and manifestation of their pathogenic action occur in a specific organism due to the effect of specific factors with the individuality of its protective forces inherent to this organism.

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USING SODIUM THIOSULFATE IN VACCINATION OF HOGS AGAINST SALMONELLOSIS

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[Article by V. S. Prudnikov, Vitebsk Veterinary Institute]

[Text] The effectiveness of preventing infectious diseases of animals largely depends on the immunogenicity of the vaccines, one of the important components of which is nonspecific stimulators of immunity--adjuvants. Many different substances having immune-stimulating properties have been studied and those among them such as aluminum hydroxide, saponin and others have found wide application in manufacture of killed and some liquid live vaccines. We found no data in the literature with respect to the use of adjuvants in vaccination of animals with dried live vaccines.

We used a 30 percent solution of sodium thiosulfate, which, as indicated by preliminary investigations on pigeons and rabbits, had better immune-stimulating properties compared to such adjuvants as saponin, aluminum hydroxide and MK-8P and MS-20 mineral oils, as a solvent of dried live vaccine of strain TS-177 against swine paratyphoid. Moreover, a 30 percent sodium thiosulfate solution had no bactericidal effect on Salmonella for 12 hours (period of observation) when dried live vaccine against swine paratyphoid was dissolved in it.

Three groups of piglets three weeks old with 10 head in each group was selected. The animals of the first group were vaccinated with dried live vaccine against swine paratyphoid according to instructions (having first dissolved it in an isotonic solution). When the piglets of the second group were vaccinated, the vaccine was diluted with a 30 percent sodium thiosulfate solution produced by the medical industry in ampules of 10 ml. The control were intact piglets of the third group, which received only the isotonic solution. The animals were immunized subcutaneously, twice at intervals of 15 days, in doses of 0.3 ml the first time and 0.8 ml the second time.

Blood samples were taken from the piglets for morphological examination and organization of RA [Agglutination reaction] on the 15th day after the first vaccination and on the 20th day after the second vaccination. During these same periods, three animals from each group were killed for immunomorphological examinations of the tissue from the point of administration of the vaccine, the lymph nodes and the spleen. Smear-impressions, in which the number of plasmatic cells was counted in 50 visual fields after fixation in methyl alcohol and staining with azure-eosine, were made simultaneously from the lymphoid organs. The T- and B-lymphocytes in the peripheral blood were identified by the method of Vuyanovic et al (1972).

Table 1. Hermogram in Swine Vaccinated Against Salmonellosis

(1) Группы животных	(2)	(3)	(4)	(5) Лейкоформула (6) Ю	(7) П	(8) С	(9) Э	М	(10) Б	(11) Л
(12) На 15-й день после первой вакцинации										
Контроль (13)	7.6	4.08	9.6	2.0	10.0	29.3	1.3	1.0	0.4	56.0
Первая (14)	9.2	4.10	9.8	1.3	7.7	19.3	1.0	1.7	—	69.0
Вторая (15)	11.26	3.82	10.1	1.0	6.0	17.0	1.7	2.0	1.0	71.3
На 20-й день после второй вакцинации (16)										
Контроль	8.56	4.30	10.6	0.3	10.7	18.3	1.0	3.0	—	66.7
Первая	9.01	4.03	9.8	0.7	17.3	20.0	0.3	2.7	—	59.0
Вторая	9.05	3.87	10.7	1.7	14.3	9.7	0.7	4.7	—	68.9

Key:

1. Groups of animals
2. Leucocytes (thousand)
3. Erythrocytes (million)
4. Hemoglobin (gram percent)
5. Leucoformula
6. Yu
7. P
8. S
9. E
10. B
11. L
12. On the 15th day after first vaccination
13. Control
14. First
15. Second
16. On the 20th day after second vaccination

The number of leucocytes increased in the peripheral blood and the erythrocyte content decreased slightly (Table 1), while the number of segment-nuclear neutrophils decreased in the leucoformula and the number of lymphocytes, the main mass of which comprised B-cells (Table 2) increased in piglets immunized with vaccine diluted with a 30 percent sodium thiosulfate solution both after the first and second vaccination. In this case the number of B-lymphocytes was 1.5 times greater than that in piglets which were administered the vaccine in an isotonic solution and was three times higher compared to intact animals. At the same time the RNA content increased in the lymphocytes in piglets immunized with vaccine in sodium thiosulfate both after the first and second vaccinations.

Table 2. Effect of Sodium Thiosulfate on Content of Specific Antibodies and Number of T- and B-Lymphocytes in the Blood of Piglets Vaccinated Against Salmonellosis

Группы животных (1)	(2)	Т-лимфоциты (3) %	тыс/мм³ (4)	В-лимфоциты (5) %	тыс/мм³	(6)
На 15-й день после первой вакцинации (7)						
Контроль (8)	1:10	45.7	3.38	10.3	0.76	1.00
Первая (9)	1:80	48.7	4.43	20.3	1.85	1.51
Вторая (10)	1:80 - 1:640	43.0	4.86	28.3	3.19	1.80
На 20-й день после второй вакцинации (11)						
Контроль	1:10	44.0	3.78	15.0	1.29	1.73
Первая	[illegible]	50.0	4.57	16.0	1.40	1.75
Вторая	1:640	40.3	4.00	24.3	2.7	[illegible]

[Key on following page]

[Key continued from preceding page]:

1. Groups of animals
2. Titers of specific antibodies
3. T-lymphocytes
4. Thousand/mm^3
5. B-lymphocytes
6. RNA in lymphocytes (SGK)
7. On 15th day after first vaccination
8. Control
9. First
10. Second
11. On 20th day after second vaccination

Titers of specific antisalmonella agglutinins were 4-6 times higher in the blood serum of piglets vaccinated with dried live vaccine against swine paratyphoid in a 30 percent sodium thiosulfate solution compared to titers of animals immunized with vaccine diluted with an isotonic solution.

Twelve pigeons were used to check the preventive properties of the serum of immunized piglets. The serum of animals, which received the vaccine against samonellosis in a 30 percent sodium thiosulfate solution, was administered into the sternal muscle of four birds at a rate of 1 ml 24 hours before experimental infection of them with a day-old culture of S. cholerae suis of strain 203/33; four other birds were administered the serum of piglets immunized with the vaccine according to instructions and four more were administered the serum of intact piglets. The salmonella culture was also administered intramuscularly at a rate of 1.5 billion m. t.

The control pigeons were sacrificed on the second and third day after experimental infection. Morphological changes typical for acute course of salmonellosis were found in them upon dissection. Two pigeons were sacrificed from the group of birds which were administered serum from animals immunized with the vaccine, diluted with an isotonic solution, while a depressed state and poor appetite were noted in the birds remaining alive over a period of 6-7 days and body temperature was elevated by 0.5-0.7°C. There were no fatalities among pigeons which were injected with the serum of pigs immunized with vaccine diluted with a 30 percent sodium thiosulfate solution. The birds willingly ate their feed, were mobile and their body temperature increased by 0.3-0.5°C after infection and remained at this level for 2-3 days. These data indicate the high preventive properties of the blood serum of swine which were administered a vaccine diluted with 30 percent sodium thiosulfate solution.

Table 3. Plasmocytic Reaction in Lymphoid Organs of Piglets Vaccinated Against Salmonellosis

(1)	(2)					
	(3)		(6)		(7)	
	(4)	(5)				
(8)						
(9)						
(10)	7.6 ± 1.37	1.3 ± 0.36	[illegible]	[illegible]	[illegible]	[illegible]
(11)	6.9 ± 0.98	1.7 ± 0.29	[illegible]	[illegible]	[illegible]	[illegible]
(12)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(13)	[illegible]	4.7 ± 0.93	[illegible]	[illegible]	[illegible]	[illegible]
(14)						
[illegible]						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[Key on following page]

[Key continued from preceding page]:

1. Lymphoid organs
2. Number of plasmocytes
3. Control
4. Immature
5. Mature
6. First
7. Second
8. On 15th day after first vaccination
9. Lymph nodes
10. Regional
11. Counterregional
12. Remote
13. Spleen
14. On 20th day after second vaccination

Micro- and macrophage reaction was activated significantly, especially after the second vaccination in the tissue at the point of administration of the vaccine diluted with 30 percent sodium thiosulfate solution, while the number of plasmatic cells increased 1.5 times or more in the lymphoid organs (Table 3).

The results of the investigations indicate that immunomorphological changes characterized by activation of the plasmocytic reaction in the lymphoid organs, by an increase of the number of B-lymphocytes in the peripheral blood and by accumulation of titers of specific agglutinins in its serum, develop in the organism of animals upon vaccination of piglets against salmonellosis using dried live vaccine against swine paratyphoid of strain TS-177. The use of 30 percent sodium thiosulfate solution as a solvent of the dried live vaccine against swine paratyphoid, which is a good adjuvant in the given case, contributed to creation of more intensive post vaccination immunity, which was manifested by intensification of the micro- and macrophage reaction in the tissue at the point where the vaccine was administered, by an increase of the number of plasmatic cells in the lymphoid organs and by an increase of the B-lymphocyte content in the peripheral blood and specific agglutinins in its serum compared to animals immunized with the same vaccine diluted with an isotonic solution (according to instructions).

[508-6521]

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CLINICAL SYMPTOMS AND PATHOLOGICAL-ANATOMICAL CHANGES IN ANTHRAX AMONG ANIMALS

Moscow Veterinariya in Russian No 11, 1980 pp 37-39

[Article by N. G. Ipatenko, VGNKI of Veterinary Preparations]

[Text] The symptoms and course of anthrax depend on the paths of penetration of the pathogenic agent, the type and individual sensitivity of the organism and the virulence of the microbe.

A slight rise of body temperature and edema are noted with atypical course of the disease in ruminants. The animals recover, but the pathological-anatomical changes at the points of penetration of the pathogenic agent remain.

A carbuncle usually appears at the point of introduction of the pathogenic agent and edemas then occur on different sections of the body. An edema also develops around the carbuncle. The carbuncle is sometimes very large and initially sharply defined, hard, painless and then dies, beginning from the center, and changes to an ulcer. The edema has the form of a diffuse, flat, dough-like, frequently fluctuating tumor. This form of the disease is accompanied by a slight rise of body temperature over a period of 5-10 days or more.

The carbuncle appearing on the mucosa of the mouth is diagnosed as anthrax of the tongue, pharynx or throat. The body temperature initially rises in this case and then becomes normal. An edema is formed with development of the inflammatory process, which makes it difficult to swallow food, interferes with breathing and cyanosis of the mucosa appears. The tumor may be at the entrance to the larynx and sometimes at the bifurcation of the bronchi, on the neck and on the dewlap. The animal dies from asphyxiation within 24 hours.

This form of the course of the disease is frequently diagnosed incorrectly by practical veterinary specialists. Therefore, one must clearly know the characteristics of manifestation and course of anthrax.

A very rapid course of the disease is frequently observed in horned cattle and especially in small cattle. In most cases the animals die without clinical symptoms. But manifestation of the symptoms of the disease is also possible.

The body temperature rises to 42°C. Respiration becomes intermittent and labored, the visible mucous membranes are cyanotic and the pulse increases in frequency (up to 100 strokes or more per minute). The animals are depressed or strongly excited,

groan, beat the ground with their front and rear extremities and lean their heads against the wall. Flatulence of the rumen, constipation or diarrhea, dyspnea and muscle spasms are observed and the urine contains blood.

The body temperature rises to 41-42°C and the visible mucosa are cyanotic with acute course of the disease. The sick animal refuses feed, is depressed, stops chewing its cud, thirst is intensified, the look is fixed and respiration is frequent, intermittent and labored.

Lactation is reduced or stops and pregnant animals abort. There are periods of excitement and alarm alternating with depression in some animals. The pulse increases in frequency (up to 80-100 strokes per minute in cows) and the cardiac strokes are knocking. The animal moves with difficulty, draws in its head and weakness of the rear extremities, muscular trembling and constipation or diarrhea are noted. The animal dies during convulsions with asphyxia phenomena. The urine contains blood in some animals.

Focal areas of infection (on the tongue and on the upper and lower jaws) the size of a pigeon egg sometimes appear in the mouth cavity of horned cattle. When they burst, a straw-colored liquid with fibrin filaments flows out. The tissues surrounding the focal areas swell and then die.

The same clinical symptoms appear in the subacute course of the disease, but they are less clearly marked. The symptoms can disappear suddenly and the animal seems healthy (it eats food and cud-chewing begins). However, the condition deteriorates sharply within several hours. Two or three attacks alternate. Swellings and carbuncles appear simultaneously on different sections of the body (on the neck or dewlap).

Most investigators feel that the pathogenic agent of the disease appears in the blood within several hours before death. Our investigations showed that it can be found in the blood of a sick animal even with the first rise of body temperature.

The disease sometimes proceeds chronically (more than two months) in horned cattle, and in this case body temperature rises slightly and emaciation and profuse diarrhea are observed.

Anthrax proceeds differently in sheep. In some cases, an externally healthy animal falls down and can die within several minutes and in other cases the disease proceeds from several hours to days or more. Edema develops at the point of introduction of the pathogenic agent, pains in the region of the gastrointestinal tract are noted and appetite deteriorates.

Hot and painful swellings sometimes appear on the head, dewlap, lower part of the stomach, udder and scrotum and the painfulness disappears after a time. Paralysis of the front and rear extremities begins in some sheep prior to death, the neck joints twist and a foamy or bloody-foamy discharge appears from the nasal and mouth cavities and anus. The urine is bloody and profuse diarrhea alternates with constipation.

Colic (similar to symptoms of volvulus or invagination of the intestines, but feces or gases are not accumulated and therefore there is no swelling of the

stomach) is observed in horses with this disease. Defecation becomes more frequent (this symptom is not observed in ordinary colic). Traces of blood are sometimes found in them. Respiration becomes more frequent.

Swellings on the neck, dewlap, stomach, udder, scrotum and other parts of the body appear in some horses. They are initially hot and painful and then become cold, compact and painless and the skin in the center of the swelling dies and an ulcer forms. The body temperature rises to 41°C. The disease continues for 8-12 or 24-36 hours and sometimes for 3-8 days.

The disease is very frequently found among dogs. Disordered activity of the gastro-intestinal tract is observed when they are affected, the pharynx swells severely and the nostrils, lips and tongue become inflamed in some. Edemas rarely appear on the skin.

The pathological-anatomical changes in animals are typical. They are clearer, the slower the disease proceeds, with the exception of atypical and chronic course. Upon dissection of animals that died from the septic form of anthrax, rigor mortis is weakly marked or absent, the carcass is usually swollen and putrefies rapidly.

A bloody fluid is discharged from the natural openings, the mucous membranes are cyanotic and contracted with hemorrhages. The subcutaneous and intermuscular tissue contains gelatinous, yellowish infiltrates penetrated by hemorrhages. Therefore, the skin is dark red in color on the inner surface.

Similar infiltrates are present under the lobes of the costal and pulmonary pleura, in the mesentery, perirenal tissue, frenulum of the tongue and at other points. The tunica serosa are studded in places by petechia and small hemorrhages. A turbid, red fluid is contained in the abdominal and chest cavities.

Especially typical changes are observed in the spleen and lymph nodes. The spleen is enlarged (sometimes fivefold), or flaccid consistency and upon removal spreads out on the table, losing its contours. Its pulp is soft, produces abundant scale and is colored dark red or black red.

The picture of the follicules and trabecules is indistinct. Softening of the pulp is sometimes so sharply marked that it flows from the surface of the cut in the form of tar.

The muscles are flaccid and brick red in color. The liver and kidneys are somewhat enlarged, brick red or cherry red in color and filled with blood. These organs and the heart are in a state of granular degeneration.

The lymph nodes are changed, hemorrhagically inflamed, enlarged in volume and dark or black red and sometimes brick red in color with punctated, dark-cherry red hemorrhages. The surface of the cut of the lymph nodes is moist-bloody and brilliant. Changes in the mesenterial and regional nodes are more clearly marked.

Infections of the gastrointestinal tract are constant and especially marked in the duodenum and jejunum and gelatinous edema of the mesentery, hemorrhagic lymphangitis and lymphadenitis of the regional nodes are observed.

The lungs are plethoric and edematous and in some cases there are lobular foci of a dark red hemorrhagic pneumonia.

The mucous membranes of the respiratory tracts (especially at the entrance to the larynx is hyperemic, edematous and shrunken with ecchymoses. The blood is dark (from dark red to black red), does not coagulate and is sometimes reminiscent of liquid tar in external appearance. It oxidizes poorly in air and slowly acquires a lighter color.

The brain and spinal column are changed, hyperemic, with hemorrhages in the gray matter and its membranes.

The brain has a pattern as in hemorrhagic meningoencephalitis in sheep that have died with the apoplexic form of the disease. Impregnation of the soft brain tissues, the affected parts of which appear like large flat hemorrhages, with exudate, was especially appreciable. Similar changes are also found in horned cattle.

The duodenum and jejunum are primarily affected in the intestinal form of the disease in horned cattle. Diffuse-focal hemorrhagic enteritis and inflammation of the lymph nodes and vessels of the mesentery were found upon autopsy. There was an exudate into the abdominal cavity.

Sharply defined, round enlargements, dark or black red in color, covered with fibrin film, are clearly distinguished on the hyperemic mucosa of the intestine. These prominences were elongated in shape in Peyer's patches.

Necrosis of the carbuncle begins in time and a gray-brown scab forms on it. The size of the scab usually depends on the size of the inflamed section. Carbuncles in the intestine are usually established even before autopsy since they are clearly discernible on the side of the serosa (there are fibrin films and hemorrhages at these locations).

The last stages of the disease are characterized by a discharge of a fibrin-like exudate and necrosis of the tissue, which begins with separation and breakdown of the epithelium and gradually spreads to the mucosa and submucosa themselves. The lymph and sanguiferous vessels are hemorrhagically inflamed in the region of the carbuncle, there is thrombosis and necrosis of them is observed with a prolonged course of the disease. The lymph nodes, sanguiferous vessels and vessels of the mesentery are gelatinously edemic.

The pathological-anatomical changes are localized in the chest cage with the pulmonary form of the disease; there is hemorrhagic or fibrinous-hemorrhagic pneumonia with exudate into the pleura.

The skin form of anthrax in horned cattle, horses and sheep usually proceeds in the form of a serous-hemorrhagic edema; therefore, the pustules and dark scab typical for a carbuncle do not form. Primary carbuncles on the animal's skin are a rare phenomenon. They have the form of a grayish red pustule with bloody contents or surrounded by swelling, in the center of which a scar and then an ulcer soon appears.

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LITTLE-KNOWN VIRAL DISEASES (SURVEY OF FOREIGN LITERATURE)

Moscow VETERINARIYA in Russian No 11, 1980 pp 68-70

[Article by R. M. Alekhin, I. A. Bakulov, D. I. Kozlova and V. A. Beskhlebnov]

[Text] Communications have appeared during the past decade on recording of previously unknown diseases with which people were infected from wild animals. They include Marburg disease (1967), Lhasa fever (1969), Tatagine fever (1970), Ourango fever (1972), Sao Paulo encephalitis (1975) and hemorrhagic fever discovered in The Sudan and Zaire (1976).

The source of the pathogenic agent of the disease and the reservoir are monkeys, rodents and probably other as yet unknown species of animals. These pathogenic agents are highly pathogenic to man (fatality up to 97 percent) and the pathogenicity to animals has not been studied. Man is an active source of the pathogenic agent. Up to eight sequential transfers of Ebol virus from man to man has been described (Casals, 1978).

Diseases are capable of assuming the nature of an epidemic within a short period. Diagnosis is difficult with regard to the nonspecific nature of symptoms and the similarity of the clinical manifestation to many widespread diseases. They proceeded during the early stages in the form of nonspecific flu-like diseases and were accompanied by fever, headache and pains in the joints and muscles.

Hemorrhagic diathesis with hemorrhages from many organs later developed and the bleeding was very difficult to stop. The central nervous system was also affected. Pharyngitis and tonsilitis were constantly recorded in patients with Lhasa fever.

The danger was aggravated by the absence of means of treatment and specific prevention and also by the lack of study of epidemiology (Mohr, 1970; Monath, 1974).

The most dangerous among the enumerated nosological units is Marburg disease and Ebol and Lhasa fever.

Marburg disease. The virus of this name was first encountered in 1967 when 31 cases of human illness with a previously unknown hemorrhagic fever with high fatality--29 percent--were recorded in Marburg, in Frankfurt-am-Main and Belgrad (Martini et al, 1968; Stille et al, 1968).

The disease was recorded among maintenance personnel and workers of laboratories in three scientific research institutes where poliomyelitis vaccines were prepared. It was established that the primary source of the pathogenic agent was monkeys Cercopithecus aethiops and green guenons imported from Uganda (Hennessen, 1968). Personnel who contacted the live monkeys did not become ill.

The infection proceeded as a result of working with cell cultures obtained from the tissues of externally healthy monkeys. Ordinary measures of prevention (wearing rubber gloves, masks and protective clothing) did not provide protection from infection.

The medical workers of hospitals where those who fell ill were admitted then became ill. One case was a result of family contact.

The Marburg virus was isolated in Africa only in 1975 from a sick Australian travelling through Rhodesia, who infected his female travelling companion, and then the hospital attendant upon arrival at Johannesburg (Union of South Africa). One person died as a result (Siegert, 1978).

The virus is named for the location of the primary isolation and identification, is related to RNA-containing viruses, is pleomorphic, has an outer lipoprotein membrane, multiplies in the cell cytoplasm and is released by gammation from the plasmatic membrane.

Filament-like virions with rounded poles or bent in a horseshoe shape and also in the form of a loop or the knot on the end of a thread, sometimes with bulb-shaped branches, predominate. Ring-shaped structures are also found.

The size of the virus is unusual: average length is 665 nm and diameter is 70-80 nm, but virions 900-1,200 nm long have been described (Smith et al, 1967; Knothe, 1968; Bowen, 1969; Almeida, 1971).

According to preliminary data the pathogenic agent is related to rabdoviruses (Hennessen, 1971; Casals, 1978). However, it differs considerably from representatives of these groups in size and structure of the nucleoid and also has no antigenic affinity with them. Some investigators propose that the Marburg virus be regarded as unclassified while others distinguish it together with the Ebol virus to a new independent group of tuburnaviruses (Simpson et al, 1977).

The pathogenic agent is resistant to high temperature: total inactivation at 56°C is noted within 60 minutes (Bowen et al, 1969). It is sensitive to ether, chloroform and desoxycholate and is subject to inactiviation by formalin and beta-propiolactone (Molherbe et al, 1971).

Monkeys (fatality of 100 percent), guinea pigs and hamsters were highly sensitive in experiment with different methods of infection, whereas guinea pigs, hamsters and mice showed resistance (Smith et al, 1967). The clinical pattern of the disease in monkeys is similar to that in humans.

The pathogenic agent reproduces in the primary and inoculated cell cultures of different origin without marked TsPD [expansion unknown] (Zlotnick et al, 1968). It forms intracytoplasmatic inclusion bodies, detected by the immunoflorescence method,

in the cell culture (Johnson et al, 1977). It reproduces in mosquitoes of Aedes aegypti infected intrathoracically and remains in their organism for 21 days (Kunz, 1968).

The virus is released from the blood of patients (during fever) and also from the liver and other organs of dead people and in some cases from throat smears, from the urine, sperm and aqueous humor of the eye (Kissling, 1968; Siegert et al, 1968). The high concentration of the virus in the blood contributed to rapid diagnosis based on direct discovery of virions in the plasma using electron microscopy and isolation of the antigen by the fluorescence method (Siegert, 1971).

Due to its morphological similarity to Ebol virus, electron microscope examinations alone are inadequate for diagnosis. The pathogenic agent must be isolated and serological identification of it must then be made (Simpson et al, 1977).

The main path of infection is the respiratory tract and conjunctiva. Other paths have also been described: skin (in the assistant of the pathoanatomist) and sexual (the wife of a technician who became ill three months earlier; Martini et al, 1968).

Fatalities were recorded only among primarily infected persons. The chain of transmission of the pathogenic agent among humans was broken after the second infection.

The virus was isolated upon relapses of hepatitis and also from the sperm and aqueous humor of the eye within 80-83 days after the beginning of the disease (Shu et al, 1968).

Natural reservoirs of the virus in Africa have not been finally established. Monkeys remained clinically healthy, but complement-binding antibodies were detected in the blood of 30 percent of them. No symptoms of any epizooty among monkeys at the locations where they were caught in Uganda were determined at this time (Kalter et al, 1969; Henderson et al, 1971).

It is hypothesized that the monkeys are not the reservoir of the virus but only a random host the same as humans (Slenczka, 1971).

Hemorrhagic fever identified in The Sudan and Zaire. In 1976 two epidemics similar in clinical symptoms to Marburg disease were recorded simultaneously in the northern part of Zaire and the southern part of The Sudan (a distance of approximately 1,500 km). More than 300 persons in The Sudan became ill and 151 died, while 237 and 211, respectively, became ill and died in Zaire.

Of 230 workers in the Sudan hospital, 76 were infected and 41 died at that time. After the patients were transferred to other clinics, epidemics also broke out there (Bres, 1977). Fatality comprised 90 percent or more. When processing material obtained from African patients, a worker at the Porton Microbiological Center in England became ill (Emond et all, 1977).

Ebol virus is identical in morphological and cultural-biological properties to Marburg virus, but differs from it in antigenic properties (Bowen et al, 1977; Johnson et al, 1977; Pattyn, 1977).

Ebol virus is stable to multiple freezing and thawing and is not inactivated when using ultraviolet rays (Well et al, 1977). The same methods as for Marburg virus were used in isolating it.

The index of sick rate fluctuated in the range of 3.5-15.3 per thousand. Light forms of the course of the disease were also recorded in The Sudan. The latter proceeded inapparently and was seemingly widespread. The number of secondary and tertiary cases of illness comprises 14-15 percent and the number of quarternary cases comprises 9 percent. The chain of infection was usually broken in the fourth infection (there were also cases of an eighth infection).

The pathogenic agent was transferred by the aerogenic method (Casals, 1978). Persons who cared for patients were more subject to the risk of infection. Direct contact with the blood or fluids of the patient played an important role in the hospital. In one case the virus was isolated from the sperm within 61 days after the beginning of the disease (Bowen et al, 1977).

Reservoirs of the virus in nature have not been established, transfer of the pathogenic agent by arthropods has also not been proved and the participation of rodents is suspected (Gedigk et al, 1968; Bowen et al, 1977).

Lhasa fever. The disease was first described in 1969. The history of its development is related to intrahospital infection of three American missionaries (in Lhasa and Djos hospitals in northeastern Nigeria) and two patients died. Two scientific workers were infected and one of them died when working with infectious material taken from these persons (Frame et al, 1970).

A severe outbreak was observed a year later in Djos and Vom hospitals (Nigeria). The first patient who was infected from an unknown source was hospitalized at the end of 1969. At the beginning of the 1970s 27 additional cases were recorded, of which 13 had a fatal outcome. Single cases of the disease were then observed annually (one or two patients each), but they were significantly greater during some years.

From 1969 through 1975 epidemic outbreaks of Lhasa fever were determined in a number of Western African countries (Casals, 1978).

A total of 300 cases, of which 60 were fatal, have been recorded since 1970 in the northeastern part of Sierra Leone. In 1972 there was an outbreak of the disease in the hospital at Zorzor (Liberia), and 4 of 11 who became ill died (Carey et al, 1972).

There are serological indications of circulation of the pathogenic agent of Lhasa fever in this region as early as the 1950s (Rose, 1956; Idem, 1957; Henderson, 1972).

The presence of the disease in man has been established retrospectively by serological examinations in Guinea, Senegal, Mali, the Ivory Coast, Zaire and the Central African Republic.

The virus of Lhasa fever contains RNA and lipids. The virus particles are oval or irregular in shape, 80-120 nm in diameter. The virus is sensitive to ether,

chloroform, desoxycholate and beta-propriolactone. It is classified as an arena-virus (Buckley et al, 1970).

Lhasa virus causes TsPD in Vero's cells, is highly pathogenic to adult mice, while newborn mice survive and the virus is secreted with the urine for a long time in them (up to 83 days; the observation period). Squirrel monkeys are highly sensitive to experimental infection with the virus (Walker et al, 1975).

The pathogenic agent was first isolated from the blood serum of man taken during the acute period of the disease from pleural exudate, by inoculation into a cell culture of green guenons and also by infection of mice. Neutralizing antibodies of reinfected persons can be found beginning with the third week (Carey et al, 1972).

Hospital [illegible]nel are subject to the highest risk of infection. Lhasa virus was transporte[illegible] many hospitals during outbreaks of the disease in Nigeria and Liberia. The main cases of illness are related to secondary infection, whereas tertiary cases were rarely determined (Carey et al, 1972; Monath et al, 1972, 1974). The disease very frequently proceeded in mild form or inapparently (Henderson et al, 1972; A. Jary, 1977).

The main path of transmission of the pathogenic agent is apparently aerogenic. Other paths are also possible--through the skin--and blood-sucking insects are also suspected as vectors (Siegert, 1978).

Lhasa virus was isolated in Sierra Leone from only one species of rats Mastomys natalensis widely distributed in Western Africa. The disease apparently proceeded in this species inapparently. Rodents could release the virus with urine and secretions of the mouth and nasal cavities and could contaminate food, water and soil for a long time (Monath et al, 1974).

The areas of distribution of the named diseases in Africa and on other continents have not been finally established. The reservoirs of the virus, the natural cycle of the disease in primates and the possibility of participation of other animals and insects in transmission of the pathogenic agent have also not been studied. No specific prevention has been developed and patients are treated exclusively symptomatically. It is hypothesized that these diseases have existed in nature for a long time in unrecognized enzootic focal areas (Casals, 1978).

Importation and transit of monkeys and lemurs has already been prohibited in Western Germany, Yugoslavia and in other countries where epidemics were recorded and strict instructions have been adopted to ensure sanitary conditions and to observe personal hygiene by people performing work related to the risk of infection. All experiments with monkeys are now regarded as especially dangerous (R. Siegert, 1978).

The VOZ [World Health Organization] recommends that all countries adopt similar strict measures, at the same time intensifying educational work. It is feasible to have specialized clinics and laboratories with the appropriate equipment and personnel capable of working without any risk of infection in each developed country (Beveridge, 1971).

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